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Monitoring System

Tuledad/Home Camp

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TULEDAD/HOME CAMP MONITORING SYSTEM

I. PURPOSE:

The purpose of this monitoring system is to provide a framework of studies which will be used to evaluate the grazing management program of the Tuledad/Home Camp study area. Specifically, the monitoring system will allow the land manager to determine the relative success or failure of a given grazing system and provide the basis for adjustments or changes in grazing use by livestock.

II. CONSTRAINTS:

This monitoring system will be implemented subject to certain constraints. These are:

A. It will be implemented under present levels of funding and manpower.

B. Specific components will be monitored where they have the most relevance to the management prescription for each allotment.

C. It will provide data to ascertain the success of meeting objectives for each allotment and the study area.

D. It will be designed so as to be adaptable to study areas other than Tuledad/Home Camp.

III. COMPONENTS TO BE MONITORED:

A. Vegetation

1. Utilization

a. Objectives

(1) Provide magnitude of stocking rate adjustments.

(2) Provide time schedule for pasture moves by livestock.

(3) Determine big game-livestock competition for available browse.

b. Methodology

(1) Grasses: Ocular Estimate Method

This technique determines utilization by ocular estimation of the percentage of herbage removed. This method combines several other utilization study methods. It is adapted to areas where perennial grasses are the key species and data must be obtained rapidly over large areas. Use of utilization classes minimizes differences between observers and photo guides will make training simple and rapid.

Utilization transects will be run as summarized below:

The starting point is tied to a known reference marker and the direction of the course set by compass or a clearly defined natural feature.

Establish straight line transects, across drainages if possible, in order to obtain a cross section of environmental differences in the key area.

Document the location, starting point, and direction so that future utilization studies may be conducted in the same general area.

Locate observations (an observation point is a single plant of each key species at a particular location along the transect) at constant intervals along the transect by pacing. The toe of the boot is used to determine locations. Plot or observation interval along the transect must be documented. Permanent location with stakes or other markers is not necessary.

Key species must be present; if not present at the proper interval, move to enclose the nearest plant of these species. DO NOT BE SELECTIVE. The next interval along the transect is measured from this latter point.

Utilization studies will be made at any time during the grazing period to move livestock and/or adjust stocking.

Stratification is a means of dividing a unit into smaller, more homogeneous units to reduce variance. Thus, an allotment or pasture is divided into areas having similar characteristics. Strata may be areas having similar vegetation, comparable soils, uniform topography, etc. In areas of broad, generally flat or rolling plains with uniform vegetation, climate, and soil, the entire allotment may be one stratum. Stratum smaller than 10 percent of the allotment will not normally be considered separately, unless it constitutes a highly productive area (meadow) or a crucial area. Each major habitat type may be a stratumor, according to need, the type can be further stratified using other considerations. Range readiness is an important stratification consideration as stratification may be based on seasonal use areas such as spring range, summer range, etc. Each crucial area (i.e., meadows, strutting grounds, etc.) identified in the allotment should be considered as a separate stratum. Key areas are portions of a stratum which, because of location and grazing use, serve as indicative samples of conditions within the stratum. Key areas may be considered as the "pulse" of the range.

Data will be filed in the AMP file.

Utilization classes are used to show six use ranges Estimate utilization within one of the six classes. Utilization classes are described as follows:

Class	Percent Utilization
1	0-5
2	6-25
3	26-50
4	51-75
5	76-95
6	96-100

(2) Bitterbrush: The modified Cole Browse transect method will be utilized to measure total utilization of important browse species.

Utilization will be evaluated for 50 plants on each of six transects using the modified Cole Method (FIGURE 1). Starting points for utilization transects will be the same as for the condition and trend transects. The transects will be run from the starting point to the closest bitterbrush plant within a 180 degree selection zone. From each successive closest plant, one pace is taken parallel to the general direction of the transect and the succeeding closest plant within a 180 degree selection zone is chosen from there, and so on until 50 plants have been sampled. For each sample plant, percent utilization will be estimated as recorded in one of six utilization classes (0, 5, 25, 50, 70, 90), based on the number of twigs used and percentage of each leader taken.

This technique also provides the necessary condition trend data for bitterbrush.

2. Condition and Trend

a. Objectives

(1) Determine direction and magnitude of changes in ecological condition on all habitat types as caused by the grazing management program.

(2) Provide data on total cover for use in determining soil erosion by the Universal Soil Loss Equation.

b. Methodology

(1) Habitat Types: Methods selected will minimize observer biases, require a minimum amount of time, and yet will yield valuable quantitative data. Parameters measured will be canopy coverage and frequency. Canopy coverage, the percentage of the ground included in a vertical projection of imaginary polygons drawn about the total natural spread of foliage of the individuals of a species (Daubenmire, 1959), serves as a criterion of relative dominance, of potential productivity, of the influence of plants on precipitation and light interception and soil temperature, and of the value of vegetation to animals. It permits comparison on a common basis of all plants, since plot size has no influence on the data; and evaluations precise enough for research purposes do not require excessive field time (Daubenmire, 1968). Frequency, the percentage of occurrence of a species in a series of samples of uniform size contained in a single stand, the numbers and sizes of plants in each sample being ignored (Daubenmire, 1968), is easier to measure than canopy coverage, requires less time, further minimizes personal observer bias, and readily shows changes in vegetative composition. Both parameters are used extensively throughout this monitoring system.

Stratification (Stratification is defined under utilization.) by habitat types is necessary to measure overall improvement in range condition. Assessment of more immediate responses to specific pasture use necessitates stratification by pastures within allotments.

General location of key areas for vegetation monitoring are related to the location of the key habitat types within each pasture of each allotment which share common values of various resource components. In many cases these habitat types are not only important for domestic livestock grazing but, stand out as dominant factors in wildlife and watershed conservation. Each habitat type sample will be surveyed on the ground to determine the most representative sampling site or key area to be sampled to provided the best cross section of indicators for the particular habitat type. Key areas will be selected which will allow monitoring of resource values represented.

Key species will be selected which will allow successional trends to be determined. Bitterbrush, aspen, bluebunch wheatgrass, Thurber's needlegrass, Idaho fescue, and squirreltail will be monitored on selected areas.

Three to five 100-foot lines (the number of lines varying with the heterogenity of the vegetation) will be used for shrub canopy cover (FIGURE 2). The number of individuals of each shrub species rooted within one-half meter of each side of each 100-foot line will be recorded along the shrub age and form classes.

Shrub canopy cover will be estimated in 40-60 0.1 m^2 (50 cm x 20 cm) quadrats located at five foot intervals along all of the 100-foot lines.

Canopy cover of all herbaceous species, litter and basal cover (basal area expressed as a percentage of ground area) of all bunchgrasses will be estimated in thirty 0.1 m^2 (50 cm x 20 cm) quadrats located at five-foot intervals along two of the 100-foot lines (FIGURE 2). A series of unequal classes will be used for the coverage estimates: 0-5, 5-25, 25-50, 50-75, 75-95, and 95-100%. Such classes leave little chance for personal error in class assignment, yet are adequate to bring out subtle differences when results from a considerable number of small plots are averaged (Daubenmire, 1959). Frequency may also be determined from this data.

In addition to the frequency data acquired from the cover transects, frequency transects will be read adjacent to the cover transects. The method to be used is described by Tueller _et al_ (1972). Briefly, a transect/quadrat sample using quadrats randomly placed along a permanent line will provide a minimum of 200 observation points from which frequency data can be determined.

Each stand will be monitored at six-year intervals during the "rest" year. Observed differences in canopy coverage and density can be tested for statistical significance in a randomized block analysis of variance design with stands as blocks and time as treatments. If the data are not normally distributed and homoscedastic, they must be transformed (the arc sine transformation is often used with coverage data) or analysed by nonparametric statistical designs such as chi-square as blocks and time as treatments. The data will probably require transformation for parametric tests. Nonparametric tests can be used without data transformation.

Color oblique photographs of the stand will convey the general aspect at the time of sampling.

Approximately 85 permanent transects located throughout all habitat types were established during the 1976 vegetative inventory (see TABLE 1). These transects, where appropriate, will provide a baseline for the monitoring system. Additional transects may be established following further refinement of the monitoring system.

Transects will be established on key areas within each allotment to assess allotment trends in place of using the stereo photo method. Exisitng transects which have been established may be sufficient on some allotments while others may need additional transects. Eighteen stereo photo trend plots on the Bare and Wall Canyon allotments will be continued. These were established in 1974 and 1973 respectively. They will continue to be read.

Fifteen "Parker 3-Step" trend plots were established on the study area during 1958-61. They were located and read again in 1976. They will not be monitored on a scheduled basis but will be maintained for future analysis if necessary. It is felt there are too few plots to be statistically reliable and that adequate trend data will be obtained through the Daubenmire quadrat method.

(2) Key Habitat Types: Several vegetative community types are critical to wildlife and deserve separate attention. These are the Nevada bluegrass-sedge, willow/Nevada bluegrass, aspen, white fir, and curlleaf mountain mahogany/big sage/Idaho fescue habitat types, stock ponds suitable as waterfowl habitat, and critical browse ranges. Representative stands have been located in each allotment (MAPS 1-22).

Nevada Bluegrass-Sedge Habitat Type. Canopy cover of herbaceous vegetation and litter and basal cover of bunchgrasses will be estimated in thirty 0.1 m^2 quadrats as described above (FIGURE 3). Canopy cover of shrubs will be measured plaminetrically or with a dot grid on low-level infrared aerial photographs taken by procedures described by Meyer (1973). Such photographs will also be useful in evaluating any advancement or healing of gully head-cuts. Color ground level oblique photographs will convey the general aspect of the stant at the time of sampling.

Each stand will be monitored at two or three-year intervals during the rest or deferred year. Differences in canopy cover can be tested for statistical significance in the same experimental designs described above.

Willow/Nevada Bluegrass Habitat Type. Canopy cover of herbaceous species and litter and basal cover of bunchgrasses will be estimated in thrity 0.1 m^2 quadrats in a manner analogous to that previously described, but the quadrats will be located at 20-foot intervals along 600 feet of transect (FIGURE 4). Canopy cover of shrubs and trees will be measured planimetrically or with a dot grid on low-level infrared aerial photographs. Color ground level oblique photographs will convey the general aspect of the stand at the time of sampling.

Each stand will be monitored at two or three-year intervals during the rest or deferred year. Differences in canopy cover can be tested for statistical singificance in the same experimental designs described above.

Forest Types. Aspen and curlleaf mountain mahogany/big sage/Idaho fescue habitat types will be monitored by the use of the nest plot design described by Daubenmire (1968) (FIGURE 5). All trees within the 15m x 25m macroplot are tallied by DBH (root-crown diameter classes for mountain mahogany) (TABLE 2). Trees less than one meter tall and seedlings or sprouts are counted in one-meter wide belts along the sides of the central 5m x 25m plot (depending upon their density). Canopy cover of understory species and litter is estimated in thirty 0.1 m^2 quadrats at five-foot intervals along the sides of the central plot in a manner analogous to the previously described one.

Color ground level oblique photographs will convey the general aspect of the stand at the time of sampling. Low-level infrared photographs will demonstrate gross changes.

Large 3-way exclosures on selected aspen stands will be established to allow assessment of livestock-wildlife interactions with aspen reproduction.

Each stand will be monitored at two or three-year intervals during the "rest" year. Differences in frequency distributions of tree diameter classes can be tested for statistical significance with chi-square analysis. Differences in canopy of understory vegetation can be tested with a paired-sample test.

Waterfowl Habitat. Waterfowl habitat will be monitored utilizaing the 0.1 m^2 quadrats for herbaceous species and litter. Residual vegetation suitable for waterfowl nesting will be monitored on one shoreline plot and one adjacent upland plot. Total herbaceous cover will be recorded for thirty 0.1 m^2 quadrats at five-foot intervals along two 75 foot lines. Cover estimates will be made in six unequal classes (0-5%, 5-25%, 25-50%, 50-75%, 75-95%, and 95-100%).

Twenty transects as 10 waterfowl habitat sites will be sampled using the Daubenmire method. These will be less than the "Each lake and stock pond suitable for waterfowl" as called for in the ES. The sample size is large enough to indicate whether objectives are being met. Extrapolation can be made to other areas.

Ground level oblique color photos to illustrate general aspect, and low-level color infrared aerial photos to monitor gross habitat changes will also be taken.

Waterfowl habitat will be monitored annually at the end of the grazing season (October).

Browse Ranges. Key browse communities will be sampled by the modified Cole Browse Survey Method (FIGURE 1) and nested plot (Daubenmire) methods. Condition and trend are judged on the basis of form and age classes. These methods are described above.

Land Treatments. At lease three 100-foot line transects will be established in each land treatment area (spray, burn and seeding). Shrub canopy cover will be measured before and every five years after treatment. This will allow evaluation of brush reinvasion.

3. Actual Use

a. Objective

To provide accurate information on levels of use by livestock, so that meaningful comparisons to utilization and condition and trend data can be made.

b. Types of Actual Use Data

- Actual Grazing Use Survey (Form 4412-8)
- Physical Counts by BLM Personnel
- Forest Service Records

c. Use of Actual Use Data

- Determination of Annual Billing
- Determination of Grazing Trespass
- Adjustment of Utilization Data to Determine Proper Grazing Adjustments

B. Wildlife

1. Fisheries

a. Objectives

See Vegetative Condition and Trend.

b. Methodology

Physical, chemical and biological properties will be monitored at four stations along Bare Creek (Tuledad), and one station on Silver Creek (Tuledad), Selic Creek (Selic-Alaska) and Wall Canyon Creek. Physical and chemical characteristics will be sampled annually at all seven stations. Data collected will include: stream width, stream depth, stream flow, condition of benthos (amount of usable gravel in stream bed), bank erosion, streamside cover, and stream shading. Stream flow, conductivity, temperature, dissolved oxygen, suspended sediment, coliform bacteria, phosphorous and plankton will be monitored under the water resources program and used in evaluation of fisheries habitat condition.

Biological data will be gathered once every four years in cooperation with California Department of Fish and Game. Macro invertebrates will be sampled (four samples per station) with a surber sampler. In addition, physical barriers to fish movement, pollution sites and any other unstable features will be recorded. Electroshocking of fish will also be conducted at this time.

This aquatic monitoring system deviates from the one proposed in the ES (Appendix D) by dropping the monitoring on gradient, turbidity and pH. The above mentioned stream characteristics will not be used as a basis for management change and therefore, are not needed in the monitoring system. It is felt vegetation management will do little to change the gradient of streams (i. e., raise stream bed to original level) but that special structures would be required. Turbidity and pH will be included in the water resources monitoring.

Two sample sites in addition to those proposed in the ES were added to the sampling system. They are Selic Creek and Wall Canyon Creek and are necessary to reflect the impact of the AMPs on the streams contained in these allotments.

2. Nongame

a. Objective

Determine how grazing practices are influencing numbers of wildlife species. Remaining objectives are stated under vegetative condition and trend utilization and water.

b. Methodology

Nongame species occurrence is a reflection of habitat condition. The Bureau is more concerned with habitat while responsibility for animal numbers rest with state Fish and Game Departments. However, it is impossible to totally separate animals from habitat. Therefore, the primary emphasis of the monitoring system is aimed at habitat evaluation. In order to gain a better understanding of the interrelationships and affects of habitat condition and change, animal monitoring must also be conducted for nongame species.

Nongame species monitoring will be conducted in each of four critical habitat types (willow, aspen, meadows, and mountain brush), and in each type of land treatment project to be implemented. Species occurrence data will be gathered from one site in each of these habitat types in a three pasture system (Bare) and a two pasture system (Tuledad), for a total of eight monitoring sites in critical habitat types, plus at least four sites in land treatments.

Small mammals will be sampled by a combination of live trapping and snap trapping as described in the Cowhead/Massacre habitat inventory.

Nongame birds will be sampled on the same schedule using the variable strip transect metnod (Emlen, 1971).

Data gathered in land treatment areas will be compared to cover data on brush reinvasion.

Implementation of the above aspects of the Tuledad/Home Camp monitoring system will provide an adequate evaluation of success of the various grazing systems in achieving wildlife related goals as established in the ES and MFP.

3. Game

Data on game species will be obtained from California Fish and Game and Nevada Department of Wildlife when available.

C. Cultural Resources

1. Objective

To assess the nature and intenstiy of cumulative, ongoing impacts upon identified properties judged eligible for the National Register of Historic Places.

2. Methodology

The program has been designed to recognize early in the implementation of proposed grazing systems any tendency toward the accumulation of intolerable adverse impacts on cultural resources. The nature of such impacts, as well as their intensity will be studied and quantified, and thresholds of impact tolerance will be defined.

The monitoring of presently known NR quality sites requires that 27 properties be visited throughout the planning unit, and that objectively measureable criteria of disturbance be established within each. Photo plots will be permanently established to compare the condition of each site at the end of each grazing season with the original (1980) condition. Nearest neighbor analysis will be performed to render indices of spatial displacement. Response to the monitoring program will require site specific management adjustments where annual displacement indices (gross displacement divided by frequency of grazing season) equal a statistical significance at the .01 level.

The 106 compliance inventory program (accepted by the Nevada SHPO) requires the annual survey of one percent of the planning units (approximately 11 square miles). This inventory effort will expand upon and will refine the original ES inventory data. The inventory will identify additional National Register quality sites warranting protection from the grazing regime, as well as contributing significantly to the overall sensitivity model of the planning units. National Register quality sites newly discovered in the annual inventory will be incorporated in the monitoring, subject to the methods, thresholds, and adjustments described above.

D. Soil Movement

1. Objective

a. The purpose of this program is to establish whether or not the grazing and vegetative management programs adequately protect the soil against erosion.

b. See objectives stated under Vegetative Condition and Trend and Water Resources.

2. Methodology

The USLE (Universal Soil Loss Equation) provides a means for evaluating the effectiveness of cover in controlling erosion. The USLE is stated:

A = R K L S C P

A is predicted soil loss in tons per acre per year.

R is the rainfall and runoff factor including snowmelt. For California and Nevada Planning Unit, R values can be obtained from maps.

K is the soil erodibility factor. It can be obtained from soil type or produced by nomograph.

L is the slope-length factor.

S is the slope-steepness factor.

Both L and S are ratios in comparison to standard erosion loss measurement plots.

C is the cover and cover management factor.

P the support practice factor is seldom utilized on range.

The USLE is a predictive equation. Soil loss computed with the USLE are the best available estimates. They are not absolutes. The accuracy of this predictive equation was tested by comparing preducted results with measure results over a ten year period for cultivated land. Fifty-three percent of the time predictions were within 10 percent of measured values. Eighty-four percent of the time they were within 20 percent of measured values.

In developing a system of sampling for soil loss evaluation, consideration was given to: grazing management, range cover and classification, soil type and/or types, and slopes.

A limited number of long term sedimentation measurements will be carried out to check the predicted erosion losses. These measurements of sedimentation will be made on selected fenced reservoirs. This will be a direct measure of soil movement. Trap efficiency of these reservoirs will be estimated by placing a peak flow recorder in the reservoir so that peak volume and/or spilling can be measured. On side slopes to some reservoirs, lysimeter troughs will be placed to measure on-slope soil movement.

The sampling intensity and frequency needed to make a reliable decision are estimated for the range cover. It will be necessary to stratify the range sampling for purposes of cover evaluation or its inverse, the percent of bare soil. The strata will be differentiated on the basis of: (1) Two year rest-rotation systems versus three year rest-rotation systems; (2) Soil associations and/or soil series from the point of view of the soil as an erosion hazard (classes are severe, moderate, and slight); and (3) range condition. The two major condition classes of poor and fair will be sampled. Six 100-foot transects will be completed on each rotation-soil erosion hazard class; by condition classes fair versus poor. This number of transects should generate a mean value that is within ± 10 percent of the true population mean value. This value was arrived at by utilizing bare soil values from the 1970 Tuledad/Home Camp transect surveys. The calculations were carried out in accordance with the examples and instructions contained in Appendix 8 of the draft (Soil-Vegetative Inventory Method (1731) (SVIM)).

There are no data from which to calculate an adequate sample size for small reservoir sedimentation. It is assumed that 12 such reservoirs may be adequate.

E. Water Resources

1. Objective

a. The objective of water quality and stream monitoring in the Tuledad/Home Camp ES area is to provide information necessary to determine if grazing activities are impacting water resources to an extent that beneficial uses of the water are being degraded and to establish trends in change of water quality.

b. The objective of water quantity monitoring of springs and wells is to provide information necessary to determine if water uses are negatively impacting long-term water table elevations and long-term spring yields.

2. Methodology

a. Quality

Four closed drainage systems have been identified which have significant amounts of the stream sides in the habitats which are representative of the three major erosion classes addressed in the ES. More than 72 percent of the ES area is covered by the habitat types which will be distinguished in the monitoring.

These drainages have been reviewed through aerial reconnaissance for suitable station locations and access. A total of 36 monitoring stations were found to be potentially suitable for monitoring water including five "Trend" Stations (MAP 23). Suitable monitoring stations have been located where stream channels leave pastures managed through one of the two major grazing systems i.e., the two pasture rest-rotation system and the three pasture rest-rotation system.

Two types of trend monitoring will be conducted. Those representing general trend and those representing trends by grazing system. Five stations on easily accessible perennial or representative intermittent drainages will be monitored frequently for very general trend conditions. As such the data may represent all upstream conditions including non-BLM activities. In addition to providing trend information these stations will provide some control of temporal and stocastic variation, as well as aid in establishing "event" monitoring. Automatic sampling and/or recording devices would considerably aid in sampling at these locations.

In order to establish trend conditions representing BLM management only, an additional six stations will be monitored at a sufficient frequency to correlate water quality conditions to the annual hydrograph. These stations will be located at points immediately downstream from pastures managed through each grazing system. Accessability will be a limiting factor dictating the sampling frequency, however major runoff events will be monitored whenever possible.

In order to determine the source of pollutant discharges to the stream channel the pollutant, pollutant indicator, or data collected at the "trend stations" will have to be analyzed. Much valuable information can be obtained in this manner, however the relationships of the collected parameter with upstream sources must first be developed. This will require "bracket or above and below" monitoring. Monitoring stations have been located so that they will bracket 11 habitat types representing more than 72 percent of the ES area.

The timing of pollutant discharges leaving the watershed will be evident from the Trend Station data, however timing of delivery to the stream channel may very well occur during a low flow period where it will be stored in-channel to be flushed at a later time. Adjustments in management will require a knowledge of the timing and process that the "bracket" stations provide.

As relationships become evident, some "bracket" monitoring may be reduced for the purposes of calibration. It is worth pointing out that with essentially no water data in the area that the initial monitoring must be considerably more detailed in order to establish the current relationships and trends which will be used later on to provide the information necessary to establish an abreviated program. Depending upon the timing and magnitude of occurrence of the stocastic variables, program reduction may begin in one to three years from program initiation.

In order to determine the extent of impact of grazing activities on beneficial uses of the water, pollutant loads must be quantified for comparison with established standards for those uses, or so that a resource specialist will have meaningful data from which to make a determination of impact. This quantification will also have to be expanded to reflect conditions in the entire ES area. This type of quantification can be determined by quantifing the pollutant loads generated from the major representative habitat types then statistically expand the data. "Bracket" monitoring as previously described will be used for the quantification of data.

Trend stations without calibration will provide:

- Quantitative information about those constituents and characteristics monitored at that location and time.
- With time (years), temporal trends in those constituents and characteristics monitored (this point data can be generalized for the watershed which drains to the station).
- Good hydrograph data.
- Good access.

Trend stations without calibration will not provide:

- Any quantitative information about the ES area as a whole.
- Any information regarding source of pollutant or degradation.

- The information necessary to determine the effect of implemented practices.

- The information necessary to develop "Best Management Practices."

- For a reduction in monitored constituents in future.

- A distinction between BLM practices and those of the private or any other sector.

Trend stations with special and temporal calibration will provide in addition to above:

Quantitative information about characteristics and constituents as they relate to habitat types representing more than 72 percent of the ES area.

- More reliable temporal trend relationships.

- Runoff response relationships.

- Will inable pollutant source identification.

- Information needed to determine the effect of implemented practices on surface waters.

- Information for management adjustments recommendations.

- For the development of BMPs for water quality.

- Correlation sufficient to reduce sampling frequency, numbers of constituents sampled, and number of calibration stations.

- Monitoring adjustments to reduce scope of monitoring where problems are not occurring and to key in on those where they are or in other ways change emphasis to assist in management decisions.

Bracket stations will provide:

- Spatial calibration of runoff and seston response.

- Directly provide pollutant source by habitat type.

- Information to key in on the specific habitat type.

- Will allow for other site specific variables to be accounted for.
- Provide for habitat type-specific recommendations and adjustments.
- For limited comparison of the two pasture and the three pasture grazing systems.

b. Quantity

Initial yield and static water level will be recorded for all new wells. Yield will be measured for key springs. Key wells and springs within selected areas will be monitored on a monthly basis during primary season of use.

c. Constituents to be Monitored

All constituents monitored will be collected and analyzed in accordance with the National Handbook of Recommended Methods for Water-Data Acquisition (U.S. IACWD, 1977). The data that will be collected included: discharge, precipitation, turbidity, suspended sediment, clay mineral constituents, particle size distribution, temperature, pH, specific conductance, dissolved oxygen, nitrogen, phosphorous, organic matter (COD or TOC) coliform bacteria, fecal strep. bacteria, plankton, seston (dry and ash wt.), periphyton algae and yield. Frequency of sampling each constituent will vary in accordance with calibration characteristics. The following briefly discusses the importance of each constituent.

> Stream Discharge. Measured continuously or intermittently, stream discharge provides two types of information. First, if reported frequently enough, it provides the information necessary to construct the annual composit hydrograph and the storm unit hydrograph. This information indicates where to most effeciently concentrate sampling efforts for the other constituents. The hydrograph also allows a determination of the volume of water available for use and some indication of the effect of management on runoff and stream flow.
>
> Second, discharge measurements are used in reporting other constituents; for example, daily discharge of suspended sediment. It also allows comparisons of stream flow with monitored constituents.

Direct and indirect methods will be used. A number of indirect methods are available including: radio or microwave telemetry, recording guages, crest-stage guages, etc. (in the order of desireability).

Precipitation. The amount, intensity, and seasonal distribution of rainfall within a given drainage basin are prominent factors in determining the type and density of vegetal cover, and the types and rates of weathering and erosional processes. Among the factors that determine the quantity and rate of stream runoff during individual storms are antecedent rainfall and the amount and intensity of rainfall during the storm itself.

As is the case with most of the monitoring design, several options are available. In addition to utilizing published daily rainfall values of NOAA, guages may include everything from continuous tele-transmitted units, recording guages, standard guages, to tin cans. Ideally, recording guages should be located at the major Trend Stations.

A representative number of "All-Weather Rain Guages" should be located throughout the ES area. The limited capacity of these guages, and infrequent servicing of guages at remote stations may result in some guages overflowing during periods of exceptionally intense rainfall. Guages should be equipped with overflow collection vessels to prevent loss of record from overflow.

Turbidity. Turbidity of a solution is a light-scattering phenomenon. The turbidity of a sample is the reduction of transparency due to the presence of particulate matter. Suspended materials such as clay, silt, microscopic organisms, and other finely divided organic and inorganic matter all cause turbidity. Turbidity affects aesthetic properties, and light penetration through water, the well-being of aquatic organisms, and growth of aquatic plants. In some cases, turbidity/sediment discharge relationships have correlated sufficiently to allow turbidity to be used to estimate suspended sediment discharge. This relationship will have to be developed for each station and will require periodic recalibration.

Turbidity measurements will be conducted in-house.

Sediment. Sediment is solid material that originates mostly from disintegrated rock, but also includes organic material and chemical and biochemical precipitates that are transported or deposited by a stream. Suspended sediment is the particulate matter that at any given time is maintained in suspension by upward components of stream turbulence, or suspended as colloids. Suspended-sediment concentration is the velocity-weighted concentration of suspended sediment in the zone between the water surface and about 0.3 feet (0.09 m) above the stream bed, expressed as milligrams of dry sediment per litre of the water-sediment mixture. Bedload is sediment that is transported by rolling, sliding, or bouncing along the streambed. Sediment discharge is expressed as the rate, in tons, or dry sediment transported per day past a given point. Both suspended sediment and bedload are usually included.

The quantity and particle-size distribution of sediment are a function of the nature of the eroding materials and the erosional processes operating in a drainage basin. Physical and biological processes in the aquatic environment are influenced strongly by sediment. For example, if light penetration is obstructed by suspended sediment, photosynthesis may be inhibited. Sediment can also be deleterious to aquatic organisms because of direct burial, abrasive action on living tissue, and impeding percolation of oxygenated water into and through streambed gravel environments.

Suspended-sediment samples will be collected manually using depth-integrating samplers or automatically by a single-stage sampler. Depth-integrated samples will be collected using DH-48 sampler and either the equal-width-increment (EWI) methods. Grab samples may also be collected when equipment is not available.

Single-stage samples will be collected at selected sites. The single-stage samplers collect samples of storm runoff that could not otherwise be sampled because of manpower limitations. Data collected by the single-stage samplers are useful in comparing suspended-sediment concentrations between different stations during storm events. The samplers should be from the U-59B series as described by the Federal Interagency Sedimentation Project of the Inter-Agency Committee on Water Resources. The date and time of the sample collection must be estimated unless someone is present at the moment the sample was collected or a stage recorder is in operation at the site. Single-stage samplers, under certain conditions, are susceptible to recirculation, which usually increases total concentration of suspended sediment and the percentage of sand. Care will have to be taken in the reporting of this data.

Bedload samples will not be collected unless a Helly-Smith pressure-difference bedload sampler becomes available. If one should become available, EWI and EDI methods used in taking suspended-sediment samples will be modified for bedload measurements in accordance with accepted precedures.

Clay Mineral Analysis. Clay mineral constituents of sediment samples and potential source soils will be analysed and correlated in order to use Trend Stations to predict up stream conditions and processes by habitat type. Dr. Moyle Harward, Clay Minerologist at Oregon State University will provide technical advise and assistance. Cost projections are based on the use of O.S.U.'s X-ray defractometer.

Particle Size. Particle size is the diameter, in millimeters, or suspended sediment or bed material. The size distribution of suspended and bedload material is used in the computations of the total sediment transported by the stream.

Particle-size distribution will be determined either by sieve or sedimentation methods. Sieve methods measure the mead diameter of the particle. Sedimentation methods determine the fall diameter of a particle in distilled water. The fall diameter of a particle is the diameter of a sphere with a specific gravity of 2.65 that would have the same standard fall velocity as the particle.

Water Temperature. Physical events, chemical reactions, and life processes are all influenced by the temperature of water. The viscosity of water is a physical phenomenon, inversely related to temperature, that influences the sediment-carrying capacity of water. A stream with higher water temperature will carry less suspended sediment than would a stream with lower water temperature, all other conditions being equal. Chemical reactions such as the solubility of elements and compounds in water are, in part, temperature dependent. A well known example is the inverse relation between the solubility of oxygen and the water temperature. Life processes or biochemical reactions are temperature controlled. Increasing water temperature causes the metabolic rate of most aquatic organisms to increase; in contrast, the increased water temperature decreases the oxygen need of the organisms. Temperature extremes may be lethal to aquatic organisms.

Water temperature will be measured in the field using a hand-held mercury-filled thermometer. In recording the water temperature, each thermometer will be submersed for a 60-second stabilization period, and read to the nearest 0.5°C.

pH. The pH of water is the negative logarithm of the hydrogen-ion activity. Solutions with pH less than 7 are termed acidic, and solutions with pH greater than 7 are termed basic. Solutions with a pH of 7 are neutral. The presence and concentration of many dissolved chemical constituents found in water are, in part, influenced by the hydrogen-ion activity of water. At pH values greater than 8.3, for example, carbon dioxide is for practical purposes, absent, while at pH values less than 8.3, the carbonate-ion is absent. Biological processes including growth, distribution of organisms, and toxicity of the water to organisms also are influenced, in part, by the hydrogen-ion activity of water.

The pH will be measured using a portable meter with a combination glass electrode. Prior to use, pH meters will be calibrated using at least two buffer solutions; the meter will be calibrated several times during extended periods of operation.

Specific Conductance. Specific conductance is a measure of the ability of a solution to conduct an electrical current and is expressed in micromhos per centimeter at 25oC. Specific conductance is used to estimate the concentration of major dissolved solids in water. The types and individual concentrations of the anions and cations cannot be determined by the measurement. The significance of major dissolved solids in water is discussed in another section.

Specific conductance will be measured in the field and in the laboratory using a portable conductivity meter. Water samples for field determination of specific conductance will be collected at each sampling point; samples for laboratory determinations will be taken from water collected for suspended-sediment analyses.

Dissolved Oxygen. The dissolved-oxygen concentration in water is the quantity of free oxygen in solution. The corrosive action of water on metals and the solubility of many chemical elements and compounds are influenced, in part, by the dissolved-oxygen is essential for maintenance of life processes in aquatic organisms and is used as an indicator of biological productivity. Photosynthesis is an oxygen-producing process; whereas, respiration is an oxygen-consuming process.

Dissolved-oxygen concentrations will be measured in the field using the Alsterberg azide modification of the Winkler method or with a YSI Dissolved Oxygen Meter. Water samples will be collected in glass-stoppered bottles. After adding the appropriate reagents, in the Winkler method the dissolved-oxygen concentration of the sample will be determined by titrating with 0.025N phenylarsine oxide to a clear endpoint, using starch as an endpoint indicator.

Nitrogen and Phosphorus. Nitrogen and phosphorus compounds are required by all organisms for growth and production. Although there are other essential plant nutrients, nitrogen and phosphorus are the most common nutrients in natural waters that can occur in growth-limiting concentrations. In contrast, nonlimiting quantities of nitrogen and phosphorus may result in rapid plant production and cause nuisance conditions.

Water samples for nitrogen and phosphorus determinations will be collected and passed through 0.45-micrometer membrane filters. The filtered water samples will be analysed in the field and laboratory.

Organic Matter. Carbonaceous material which has been a part of living tissue is classified as organic carbon. Organic matter in water can be dissolved or suspended. Dissolved organic matter consists primarily of proteins, carbohydrates, fats, and vitamins. Suspended organic matter consists of living or dead material, either fragmented or whole. The organic-concentration in water is determined to obtain an indication of the biological productivity and the amount of potential chemical energy transported by water.

Organic concentration will be determined by analysis of either the chemical oxygen demand or by analysis of total organic carbon.

Coliform Bacteria. Coliform bacteria and fecal strep. bacteria are used as biological indicators of the sanitary quality of water and its suitability of human and animal use. Total coliform bacteria determination includes bacteria from water, soil, vegetation, and feces. Fecal coliform bacteria are that part of the coliform group present in the intestines and feces of warm-blooded animals. Fecal strep provides an indication of whether the source is human or livestock.

The membrane filter incubation method will be used in determining the total and fecal coliform bacterial colony counts. Water samples will be collected in a sterilized glass bottle and filtered. Membrane filters (0.45 micrometer) will be used to retain the bacteria. The filters for coliform will be placed on agar plates and incubated. After the prescribed incubation period, the filters will be removed from the incubator and the bacterial colonies will be counted.

Plankton. The assemblage of organisms that drift passively with the currents are collectively called plankton. Because of the direct association with the water and particularly with masses of water that move in response to wind or gravity-generated currents, the species composition and abundance of plankton are related to water quality. Moreover, the phytoplankton or plant part of the plankton directly affect water composition, notably the dissolved oxygen, pH, concentration of certain solutes, and optical properties. At times the abundance or presence of particular species of phytoplankton result in nuisance conditions.

There is no standard method for collecting and enumerating the micro-organisms comprising a plankton sample. There may be so few of them in a stream sample that many field counts must be made. Morphological differences between the plankton groups and the preservation of samples which cannot be examined immediately are additional factors which influence the selection of a phytoplankton counting method.

The Sedgwick-Rafter method is one of several procedures for determining the concentration of plankton. The method is easily performed and provides reasonably reproducible information when used with a calibrated microscope equipped with an eyepiece measuring device such as the Whipple ocular micrometer (American Public Health Association and others, 1976, p. 1024-1026).

The method is much less time consuming than the membrane filter method. The disadvantage of the method is that the Sedgwick-Rafter counting cell does not permit use of a high-power microscope objective.

An advantage of the membrane filter method is that the plankton sample is reduced to a permanent microscope slide which can be retained for later examination. This method will be utilized to analyse the seston sample to provide an indication of upstream condition. Seston plankton will be collected with a DH-48 sampler by EDI integration.

A fresh or preserved sample is filtered. The organisms reatined on the membrane from a sample are fixed with formalin. The filter is rendered transparent, mounted on a microscope slide, and the density of cells is calculated from random area counts.

Periphyton. Communities of micro-organisms growing on stones, sticks, aquatic macrophytes, and other sumberged surfaces are greatly influenced by water quality and are very useful in assessing the effects of pollutants on lakes and streams. Included in this group of organisms, here designated periphyton, are the zoogleal and filamentous bacteria, attached protozoa, rotifers, and algae, and also the free-living micro-organisms found swimming, creeping, or ledged among the attached forms.

Unlike the plankton, which often do not respond fully to the influence of pollution in rivers for a considerable distance downstream, the periphyton show dramatic effects immediately below pollution sources. Since these organisms are attached to stationary objects they provide an indication of changes occurring at the sample site only. These changes may not be a result of upstream conditions; but when considered with seston planktonic changes the source of the change becomes clearer.

Samples will be taken as follows:

a. Natural substrates: Qualitative and semi-quantitative samples will be taken by scraping submerged stones, sticks, pilings, and other substrates available at the station. Although many devices have been developed for the collection of quantitative samples from irregular surfaces, success is rarely achieved.

b. Artificial substrates: The most widely used artificial substrate is the standard, plain, 25- by 75-mm (1- by 3-in.) glass microscope slide, but other materials such as Plexiglass also are suitable. A Sedgwick-Rafter will most likely be used.

Seston (Total Suspended Matter). The weight of suspended matter in water is a significant measurement in ecological studies. For example, this value has been shown to correlate with optical properties and with temporal and spatial changes in aquatic environments. For some purposes the sample may be prefiltered through a 150 to 350-um mesh to eliminate large particles. The particulate residue remaining in the sample after prefiltration is designated microseston.

The method of analysis will be a glass-fiber-filter adaptation. A known volume of water is passed through a tared glass-fiber-filter to remove the particulate matter. The increase in weight of the filter after drying at 105°C is a maeasure of the dry weight of particulate material in the sample. After ashing the residue at 500°C the difference between dry weight and ash weight is taken as the weight of particulate organic matter in the sample. The suspended sediment will be used for analysis.

Yield. Method of measurement will depend on type of rig used to drill well. Air rotary rig will allow for measurement of yield using Parshall flume. Yield for wells drilled with a cable tool rig will be estimated using a bailer. Springs will be measured using a container of known quantity and measurement over a known period of time.

F. Precipitation

1. Objective

Provide annual precipitation data to allow for the adjustment of utilization and condition and trend information.

2. Methodology

A series of precipitation guages will be established over the study area. The guages will be located in a variety of habitat types with the purpose of sampling the entire range of precipitation. The collected data will be used to derive a forage production index for each grazing season. This index is based upon the procedure of Sneva and Hyder. The production index can be used to remove the component of variability due to precipitation.

G. Livestock Production

1. Objective

Provide information on livestock production to determine costs and benefits of grazing systems.

2. Methodology

Livestock production information will be obtained by using small samples of tagged livestock. Following these cohort samples through several grazing system cycles will allow measurement of production. Production will be measured as percent lamb or calf crop and weaning weights. The production studies will be conducted with the assistance of Modoc County Cooperative Extension.

IV. SUMMARY OF COMPONENTS MONITORED

Component	Allotment	Pasture	Frequency
1. Vegetation a. Utilization	Bare	Summit - 10 Transects Hog Mountain - 15 Transects Clover Creek - 15 Transects	Read twice while cattle are in use pastures & once after cattle are removed.
		Fox Mountain - 3 Transects	As needed.
		Hoover - 3 Transects Duck Flat - 3 Transects Old Camp - 5 Transects	Read after livestock have left in the early use year.
	Wall Canyon	East - 10 Transects West - 10 Transects Seeding - 3 Transects	Read after livestock have been removed from use pastures.
	Home Camp	Hays Canyon - 15 Transects Hart Camp - 15 Transects Grass Lake - 15 Transects	Read twice while cattle are in use pastures and once after they are removed.
	Denio	East - 5 Transects West - 5 Transects South - 5 Transects	Read twice while cattle are in use pastures and once after they are removed.
	Tuledad	North - 15 Transects South - 15 Transects	Read twice while cattle are in use pastures and once after they are removed.

IV. SUMMARY OF COMPONENTS MONITORED (continued)

Component	Allotment	Pasture	Frequency
	Selic-Alaska	Selic - 4 Transects	Read twice while cattle are in use pastures and once after they have been removed.
		Alaska - 4 Transects	
	Duck Lake	East - 10 Transects	Read twice while cattle are in use pastures and once after they have been removed.
		West - 10 Transects	
	Lower Lake	North - 3 Transects	Read twice while cattle are in use pastures and once after they have been removed.
		South - 3 Transects	
b. Condition Trend	Bare	Summit - 2 stereo photo 2 cover/frequency	Every third year in rest pasture.
		Hog Mountain - 3 stereo photo 4 cover/frequency	Every third year in rest pasture.
		Old Camp - 2 stereo photo 1 cover/frequency	Every third year in rest pasture.
		Hoover - 2 stereo photo 1 cover/frequency	Every third year in rest pasture.
		Duck Flat - 2 stereo photo 1 cover/frequency	Every third year in rest pasture.
		Clover Creek - 3 stereo photo 1 cover/frequency	Every third year in rest pasture.
	Wall Canyon	East - 2 stereo photo 4 cover/frequency	Every third year in rest pasture.
		West - 2 stereo photo 4 cover/frequency	
		Seeding - 2 stereo photo	

IV. SUMMARY OF COMPONENTS MONITORED (continued)

Component	Allotment	Pasture	Frequency
	Home Camp	Hays Canyon - 5 cover/ frequency Hart Camp - 4 cover/frequency Grass Lake - 4 cover/frequency	Every third year in rest pasture.
	Denio	East - 2 cover/ frequency West - 2 cover/frequency South - 2 cover/frequency	Every third year in rest pasture.
	Tuledad	South - 10 cover/ frequency North - 12 cover/frequency	Every fourth year in rest pasture.
	Selic-Alaska	Alaska - 4 cover/ frequency Selic - 4 cover/frequency	Every fourth year in rest pasture.
	Duck Lake	East - 5 cover/ frequency West - 4 cover/frequency	Every third year in rest pasture.
	Lower Lake	North - 3 cover/ frequency South - 3 cover/frequency	Every third year in rest pasture.
2. Wildlife a. Meadow	Wall Canyon	West - 1-600 ft. transect; 3-100 ft. transects.	Every third year in rest pasture.
	Home Camp	Hays Canyon - 1-600 ft. transect; 3-100 ft. transects.	Every third year in rest pasture.

IV. SUMMARY OF COMPONENTS MONITORED (continued)

Component	Allotment	Pasture	Frequency
	Home Camp (continued)	Grass Lake - 1-600 ft. transect; 3-100 pt. transects.	Every third year in rest pasture.
	Denio	West - 1-600 ft. transect; 2 or 3 100 pt. transects.	Every third year in rest pasture.
	Bare	Clover Creek - 1-600 ft. transect; 3-100 pt. transects.	Every third year in rest pasture.
	Tuledad	North - 1-600 ft. transect; 3-100 pt. transects. South - 1-600 ft. transect; 3-100 pt. transects.	Every other year in rest pasture.
	Duck Lake	West - 1-600 ft. transect; 2 or 3 pt. transects.	Every other year in rest pasture.
b. Fisheries	Wall Canyon	West - 1 Station	Physical & chemical: annually during low flow period (July-Aug). Biological: Every 4 years.
	Tuledad	North - Bare Creek - 4 Stations Silver Creek - 1 Station	Same as above.
	Selic-Alaska	Selic - 1 Station	Same as above.

IV. SUMMARY OF COMPONENTS MONITORED (continued)

Component	Allotment	Pasture	Frequency
c. Bitterbrush	Home Camp	Hays Canyon - 3 Transects Grass Lake - 3 Transects	Condition & Trend: Fall in rest pasture. Utilization: biannually in rest pasture; every two weeks during grazing season in use pasture.
	Denio	East - 3 Transects West - 1 Transect	Same as above.
	Tuledad	North - 8 Transects South - 4 Transects	Same as above.
	Bare	Hog Mountain - 4 Transects Fox Mountain - 2 Transects Clover Creek - 2 Transects	Same as above.
d. Waterfowl	Home Camp	Grass Lake - 1 Transect	Annually in October.
	Tuledad	North - 2 Transects South 4 Transects	Annually in October.
	Bare	Hog Mountain - 1 Transect	Annually in October.
	Duck Lake	East - 2 Transects	Annually in October.
e. Mahogany	Bare	Fox Mountain - 1 Transect	Every third year during summer when pasture is rested.
	Home Camp	Hays Canyon - 1 Transect	Same as above.

IV. SUMMARY OF COMPONENTS MONITORED (continued)

Component	Allotment	Pasture	Frequency
e. Mahogany (continued)	Tuledad	North - 1 Transect	Every other year during summer in rest pasture.
	Selic-Alaska	Selic - 1 Transect	Same as above.
f. Aspen	Bare	Fox Mountain - 1 Transect	Every third year during late spring or early summer in rest pasture.
	Home Camp	Hays Canyon - 1 Transect	Same as above.
	Tuledad	North - 1 Transect South - 1 Exclosure	Every two years during late spring or early summer in rest pasture.
	Selic-Alaska	Selic - 1 Transect 1 Exclosure Alaska - 1 Transect 1 Exclosure	Every other year during late spring or early summer in rest pasture.
	Duck Lake	West - 1 Transect	Every second year during late spring or early summer when pasture is rested.
g. Willow-Riparian	Bare	Fox Mountain - 1 Transect	Every third year during the summer when the pasture is rested.
	Home Camp	Grass Lake - 1 Transect	Same as above.
	Tuledad	North - 3 Transects	Every two years during summer when pasture is rested.

IV. SUMMARY OF COMPONENTS MONITORED (continued)

Component	Allotment	Pasture	Frequency
h. Nongame & Sage Re-invasion in Land Treatments	Bare	Clover Creek - 1 Transect Fox Mountain - 3 Transects	Every five years beginning 1980.
	Tuledad	North - 4 Transects(+ any land treatments implemented)	Same as above.
3. Cultural Resources	Bare - 5 sites & districts		At the end of the grazing season in the use pastures.
	Home Camp - 5 sites & districts		Same as above.
	Tuledad - 12 sites & districts		Same as above.
	Wall Canyon - 2 sites & districts		Same as above.
	Duck Lake - 1 district (10 sites)		Same as above.
	Lower Lake - 1 district (7 sites)		Same as above.
	Denio - 1 site		Same as above.
4. Water Resources Quality	Tuledad	North - 1 Trend 5 Bracket Stations	1. Annually during 4 major events: spring runoff; summer residual events, summer low flow, fall recharge. 2. During periods of representative concern.

IV. SUMMARY OF COMPONENTS MONITORED (continued)

Component	Allotment	Pasture	Frequency
4. Water Resources Quality (con't)	Wall Canyon	West - 5 Bracket Stations	1. Annually during four major events: spring runoff; summer residual events, summer low flow, fall recharge. 2. During periods of representative concern.
	Duck Lake	East - 2 Trend 2 Bracket Stations	Same as above.
	Bare	Duck Flat - 5 Bracket Stations Clover Creek - 5 Bracket Stations Hog Mountain - 1 Trend 2 Bracket Stations	Same as above.
	Denio	South - 1 Trend 5 Bracket Stations	Same as above.
Quantity			On a monthly basis during the primary season of use and at least every other month during season of no use as follows:
	Bare		04/01-11/01 and 12/01, 02/01
	Wall Canyon		04/01-10/01 and 12/01, 02/01
	Denio		05/01-11/01 and 12/01, 02/01, 04/01

IV. SUMMARY OF COMPONENTS MONITORED (continued)

Component	Allotment	Pasture	Frequency
5. Soil Movement	All	Will correlate with vegetative transects - 6 transects per allotment.	Every third year in rest pasture.

V. VARIANCES REQUIRING CHANGE, RECOMMENDED GRAZING MANAGEMENT CHANGE AND RATIONALE (NOTE: THESE ARE ONLY EXAMPLES AND ARE NOT INTENDED TO LIMIT CHOICES IN FUTURE GRAZING MANAGEMENT)

Variance	Recommended Changes	Rationale
1. Vegetation a. Utilization is consistently below stated use limits during grazing cycles.	Adjust stocking rate up & authorize as temporary nonrenewable during next grazing cycle consistent with T/H MFP allocation priorities and grazing decisions.	If use is below stated utilization levels, this indicates forage production is above forage demand. Allowing temporary nonrenewable up to stated limits is within Bureau policy (I.M. 79-24) and will confirm the presence of additional forage.
	Lengthen season of use (spring and/or fall) with same numbers and authorize as temporary nonrenewable during next grazing cycle consistent with T/H MFP allocation priorities and grazing decisions.	Same as Above.
	Combination of the above.	Same as above.
b. Utilization is consistently above stated use levels during grazing cycle.	Adjust stocking rate down.	If utilization is consistently above stated levels, this might indicate total forage demand is exceeding forage production which would affect the ability to meet land use objectives for the study area.
	Construct additional livestock water sources.	Additional water sources would result in better livestock distribution thereby relieving utilization levels in the service areas of existing water sources.
	Change class of livestock.	Topographical features are hindrances to good distribution of certain classes of livestock (i.e., cow-calf pairs). Switching to a yearling operation, for example, would promote better distribution thereby gaining more uniform utilization of the range.

V. VARIANCES REQUIRING CHANGE, RECOMMENDED GRAZING MANAGEMENT CHANGE AND RATIONALE (NOTE: THESE ARE ONLY EXAMPLES AND ARE NOT INTENDED TO LIMIT CHOICES IN FUTURE GRAZING MANAGEMENT) (continued)

Variance	Recommended Changes	Rationale
b. (Con't.)	Change pasture fence alignment.	Often times, fences cut normal routes of travel for livestock. A simple realighment of fences could promote easier and more normal trailing as dictated by topographical features or water distribution.
	Reduce wild horses, if present, consistent with MFP levels.	Wild horses are present year-long and removal of some or all would aid in meeting utilization limits.
	Shorten season of use (spring and/or fall).	Delaying turnout will result in additional forage being available at turnout. Earlier removal of livestock may help to stay within stated limits.
	Require herding.	Herding will promote better distribution and will introduce livestock to new areas where they normally would not go by themselves.
	Use salting and mineral supplement stations to draw livestock into areas of light use.	Using salt to promote better livestock distribution has long been recognized as a valuable tool. It "leads" livestock into light use areas thereby reducing utilization on the heavier used areas.
	Fence critical wildlive habitats (i.e., bitterbrush, mahogany stands, willow-riparian, etc.).	Excluding livestock from key wildlife areas will insure adequate forage and cover exist for wildlive needs.
	Change season of use.	Changing the season of use may actually increase livestock forage production depending on the forage species present.

V. VARIANCES REQUIRING CHANGE, RECOMMENDED GRAZING MANAGEMENT CHANGE AND RATIONALE (NOTE: THESE ARE ONLY EXAMPLES AND ARE NOT INTENDED TO LIMIT CHOICES IN FUTURE GRAZING MANAGEMENT) (continued)

Variance	Recommended Changes	Rationale
b. (Con't.)	Any combination of the above.	A combination of the recommended changes may result in less of an adverse impact to the livestock operator and still meet objectives.
c. Condition & Trend indices are up for 2 grazing cycles.	Same as 1 a.	An upward condition and trend for two grazing cycles would indicate additional livestock forage is available. Requiring the evaluation to consider two grazing cycles would assure most vairable factors have occurred and that long term upward condition and trend is actually occurring.
d. Condition & Trend indices are down for 2 grazing cycles.	Same as 1 b.	Condition and trend indices could be a direct correlation of livestock numbers, season and/or distribution. Changing one of these or a combination should result in an upward condition and trend if livestock are the problem. Also requiring the evaluation to span two grazing cycles will insure most variables have occurred and that downward trend is not short term.
	Change AMP.	The evaluation may reveal the existing AMP is not providing the required rest for vigor, etc. under existing climatic conditions. Therefore, the AMP would need to be modified to provide the required rest.

V. VARIANCES REQUIRING CHANGE, RECOMMENDED GRAZING MANAGEMENT CHANGE AND RATIONALE (NOTE: THESE ARE ONLY EXAMPLES AND ARE NOT INTENDED TO LIMIT CHOICES IN FUTURE GRAZING MANAGEMENT) (continued)

Variance	Recommended Changes	Rationale
e. Condition and trend indices are static for two grazing cycles in the early stages of the grazing management system.	Same as 1b and 1d.	If an AMP has not initiated an upward trend, obviously it is not meeting the overriding land use objective for the T/H study area. Actions as described under 1b and 1d would be required to establish an upward trend.
2. Wildlife		
a. Riparian vegetation (fisheries) has exhibited a static or downward trend for two cycles in early stages of grazing management system.	Same as 1b and 1d.	The overriding land use objective for the T/H study area is to induce and maintain an upward trend on all habitat types. Obviously, if this has failed to occur during early cycles of the grazing management system, then special management practices (1b) are required or the AMP needs to be modified or a new one implemented (1d).
b. Riparian vegetation (fisheries) has exhibited an upward trend for two grazing cycles.	No change in AMP.	If riparian vegetation is improving, then obviously so is streambank stabilization, thermal protection, etc. which directly affects the condition of the fisheries. Therefore there is no need to change anything as the fishery objectives are being met.

V. VARIANCES REQUIRING CHANGE, RECOMMENDED GRAZING MANAGEMENT CHANGE AND RATIONALE (NOTE: THESE ARE ONLY EXAMPLES AND ARE NOT INTENDED TO LIMIT CHOICES IN FUTURE GRAZING MANAGEMENT) (continued)

Variance	Recommended Changes	Rationale
3. Cultural Resources		
a. Cultural resource sites are stabilizing and are exhibiting decreased spatial displacement & breakage.	No change.	Obviously properly managed livestock grazing is benefiting cultural resources & no change is necessary.
b. Cultural resources are exhibiting spatial displacement & breakage due to livestock trampling.	Fence sites to exclude livestock use where practical.	Exclusion of livestock use on cultural resource sites will eliminate the damage from livestock trampling.
	Scientifically collect the archaeological specimens where not practical to fence out livestock.	In some cases it is not practical to fence archaeological sites to protect the values. Scientific collection & study of these sites will contribute to the knowledge of prehistoric activity in the T/HC study area and insure these values will not be lost.
c. Cultural resources are exhibiting spatial displacement due to deteriorating watershed condition.	Modify AMP to improve watershed condition.	If watershed conditions are not improving or are deteriorating, the AMP is not meeting the objectives of increased ground cover. Modification of the AMP should be geared towards improving watershed conditions.
4. Water Resources		Quality controls will be cooperatively developed through the State of Nevada under the 208 Water Quality Control Program much the same as quality controls were developed with the State of California under the Lahaton Water Quality Control Plan.

VI. COST ANALYSIS

A. Vegetation

1980	6.5 WM
1981	7.0 WM
1982	7.3 WM
1983	7.8 WM
1984	8.0 WM

80% of estimated workmonths are required between 06/01-10/31.

B. Wildlife

1980	8.5 WM
1981	5.5 WM
1982	5.5 WM
1983	5.5 WM
1984	5.5 WM

C. Cultural Resources

1980	1.0 WM
1981	1.0 WM
1982	1.0 WM
1983	1.0 WM
1984	1.0 WM

D. Soil Movement

1980	1.0 WM
1981	1.0 WM
1982	1.0 WM
1983	1.0 WM
1984	1.0 WM

E. Water Resources

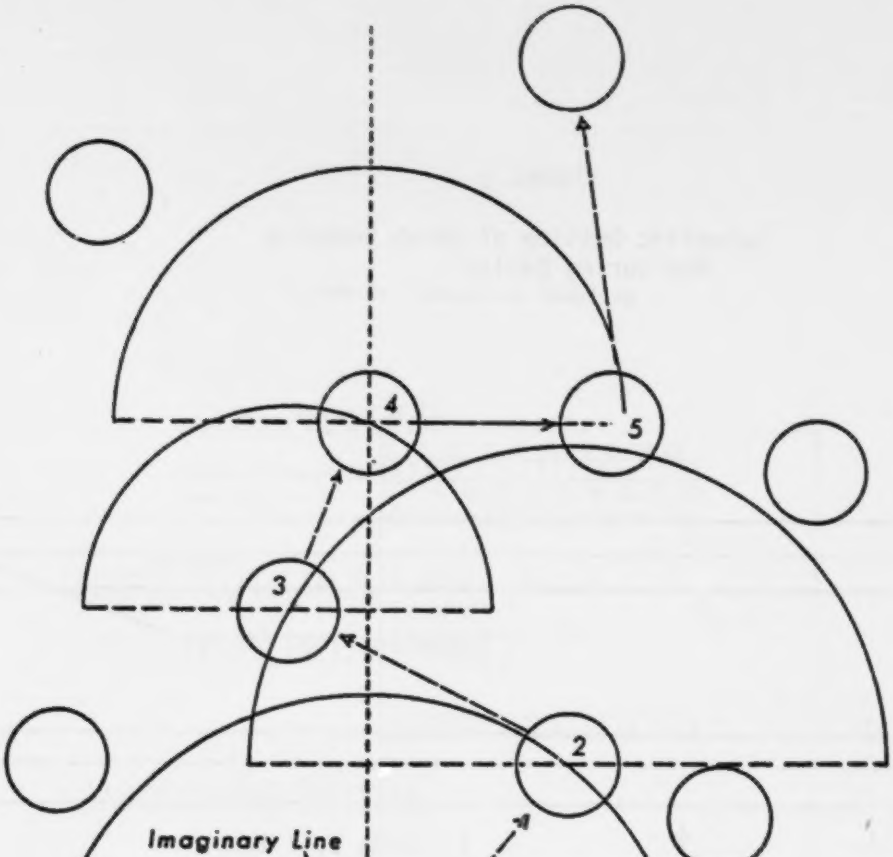
1980-1984	3.2 WM

Contract Laboratory Analysis $12,000.00

F. Total Estimated Costs

1980-1984	80 WM @ 16 W/m average/year

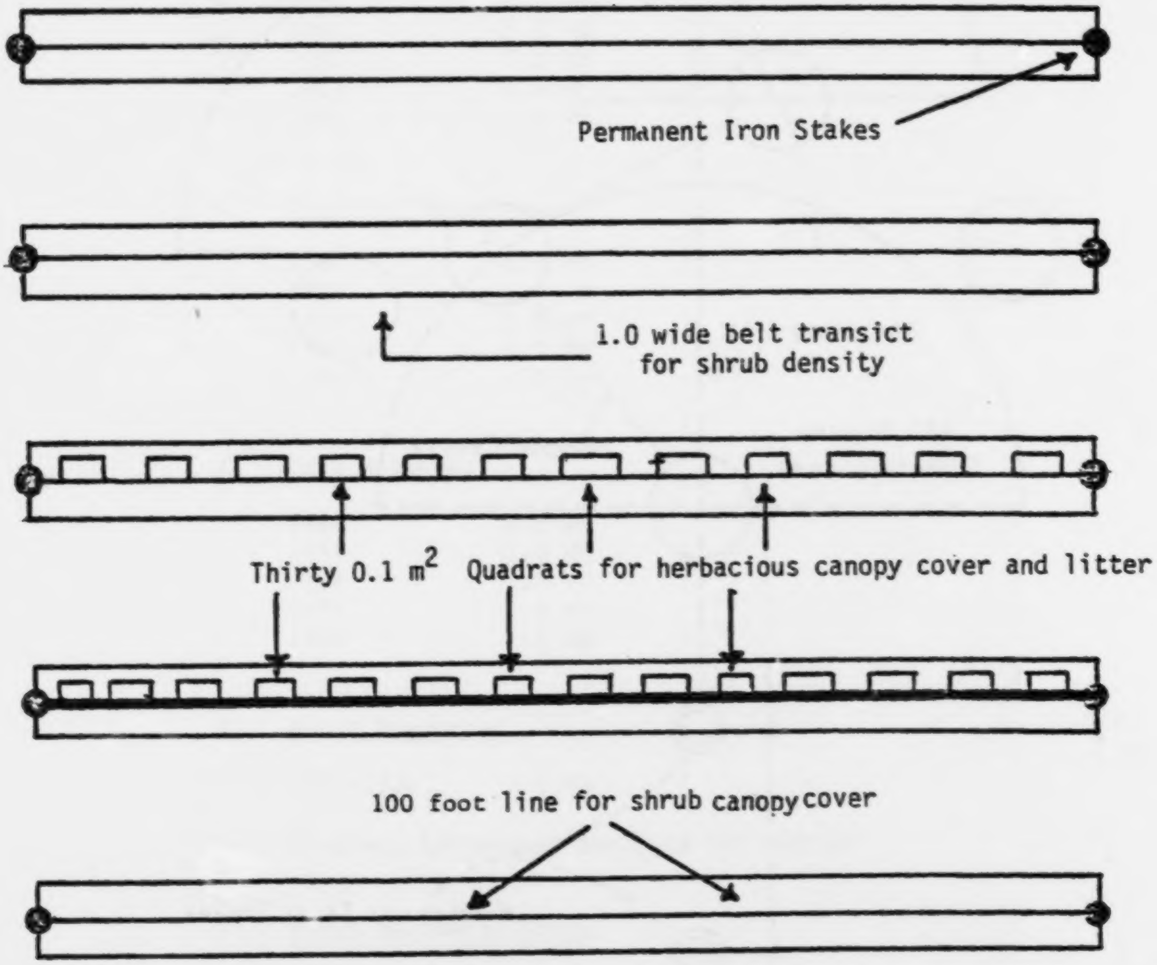
FIGURE 1
Modified Cole Method (Browse Survey)


4
5
3
2
Imaginary Line
180 Degree
Selection Zone
Sample Course
Permanent Steel Stakes

CLOSEST PLANT SAMPLING TECHNIQUE

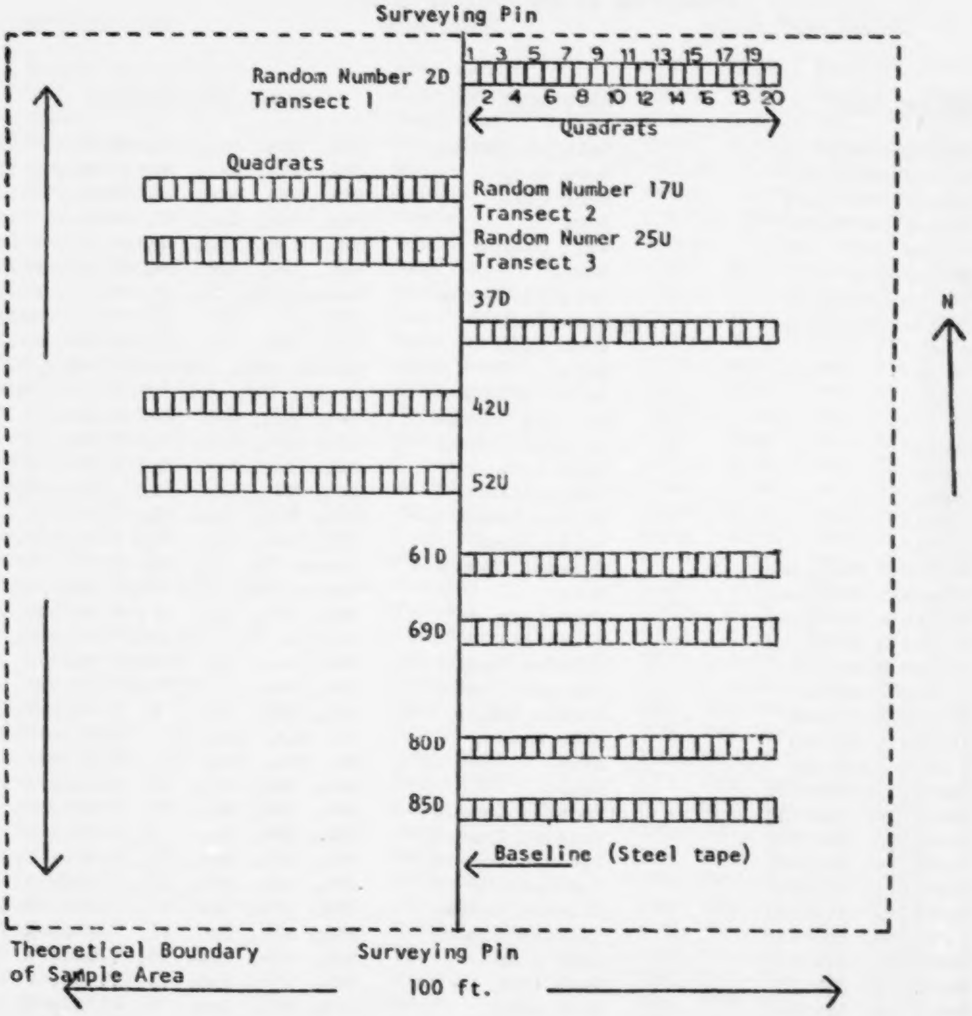
FIGURE 2

Schematic Outline of Shrub Comunity
Monitoring Design


Permanent Iron Stakes
1.0 wide belt transict
for shrub density
Thirty 0.1 m^2 Quadrats for herbacious canopy cover and litter
100 foot line for shrub canopy cover

(Drawing is not to scale)

Figure 3: Frequency Sampling


Surveying Pin
1 3 5 7 9 11 13 15 17 19
Random Number 2D
Transect 1
2 4 6 8 10 12 14 16 18 20
Quadrats
Quadrats
Random Number 17U
Transect 2
Random Numer 25U
Transect 3
37D
N
42U
52U
61D
69D
80D
85D
Baseline (Steel tape)
Theoretical Boundary
of Sample Area
Surveying Pin
100 ft.

Schematic Outline of a Macroplot
Sample Plan = 10 Transects of 20 Quadrats (10/20)

Using 20-inch frame the outline would be to scale.

TABLE 1

LOCATIONS OF VEGETATION MONITORING STANDS STRATIFIED BY KEY HABITAT TYPES

Habitat Type	Allotment	Legal Description
Meadow (NV23-23)	Tuledad Common	SE¼, NE¼, Sec. 21, T35N., R18E.
Meadow (NV23-23)	Home Camp	NW¼, SE¼, Sec. 16, T40N., R19E.
Meadow (NV23-13)	Duck Lake	SE¼, NW¼, Sec. 4, T38N., R19E.
Meadow (NV23-13)	Bare	SE¼, NE¼, Sec. 33, T38N., R21E.
Meadow (NV23-13)	Wall Canyon	SE¼, SE¼, Sec. 9, T39N., R20E.
Meadow (NV23-13)	Denio	NE¼, NW¼, Sec. 16, T39N., R22E.
Meadow (NV23-13)	Tuledad Common	Center W½, Sec. 5, T37N., R17E.
Meadow (NV23-13)	Home Camp	SE¼, Sec. 12, T39N., R18E.
Aspen	Home Camp	SW¼, SE¼, Sec. 12, T39N., R18E.
Aspen	Bare	Center SW¼, Sec. 5, T36N., R22E.
Aspen	Selic-Alaska	Center SW¼, Sec. 6, T37N., R16E.
Aspen	Tuledad Common	NW¼, NE¼, Sec. 20, T36N., R17E.
Aspen	Tuledad Common	NW¼, NW¼, Sec. 20, T37N., R17E.
Aspen	Duck Lake	SW¼, SW¼, Sec. 28, T39N., R19E.
Aspen	Selic-Alaska	SW¼, NW¼, Sec. 19, T37N., R16E.
Aspen	Selic-Alaska	SE¼, NW¼, Sec. 20, T37N., R16E.
Aspen	Selic-Alaska	SE¼, SW¼, Sec. 8, T37N., R15E.
Mountain Mahogany	Tuledad Common	Center N½, Sec. 8, T37N., R17E.
Mountain Mahogany	Bare	Center SW¼, Sec. 5, T36N., R22E.
Mountain Mahogany	Home Camp	SW¼, SE¼, Sec. 11, T39N., R18E.
Mountain Mahogany	Selic-Alaska	Center, Sec. 20, T37N., R16E.
Willow Riparian	Tuledad Common	SE¼, Sec. 13, T39N., R16E.
Willow Riaprian	Tuledad Common	SW¼, Sec. 5, T37N., R17E.
Willow Riparian	Alaska Canyon	NW¼, NW¼, Sec. 6, T37N., R16E.
Willow Riparian	Home Camp	N½, NE¼, Sec. 32, T40N., R19E.
Willow Riparian	Bare	N½, SE¼, Sec. 31, T37N., R22E.
Waterfowl Habitat	Bare	NW¼, NW¼, Sec. 31, T39N., R23E.
Waterfowl Habitat	Tuledad Common	SW¼, SW¼, Sec. 32, T39N., R17E.
Waterfowl Habitat	Tuledad Common	SW¼, SE¼, Sec. 6, T37N., R17E.
Waterfowl Habitat	Tuledad Common	NW¼, NW¼, Sec. 10, T39N., R18E.
Waterfowl Habitat	Tuledad Common	SE¼, SE¼, Sec. 12, T39N., R18E.
Waterfowl Habitat	Tuledad Common	SE¼, SE¼, Sec. 21, T39N., R18E.
Waterfowl Habitat	Tuledad Common	SE¼, SW¼, Sec. 17, T39N., R19E.
Waterfowl Habitat	Home Camp	NE¼, NE¼, Sec. 16, T40N., R19E.
Waterfowl Habitat	Duck Lake	SW¼, SE¼, Sec. 14, T38N., R19E.
Waterfowl Habitat	Duck Lake	SW¼, SE¼, Sec. 9, T37N., R19E.
Browse Range	Home Camp	T40N., R20E., Sec. 31, SE¼NW¼
Browse Range	Home Camp	T40N., R19E., Sec. 36, NE¼SE¼
Browse Range	Home Camp	T39N., R19E., Sec. 4, NE¼NW¼
Browse Range	Home Camp	T39N., R19E., Sec. 6, NW¼NE¼

TABLE 1 (Continued)

Habitat Type	Allotment	Legal Description
Browse Range	Bare Ranch	T38N., R20E., Sec. 25, SE¼SW¼
Browse Range	Bare Ranch	T38N., R20E., Sec. 13, NW¼SW¼
Browse Range	Home Camp	T39N., R19E., Sec. 4, SE¼NW¼
Browse Range	Home Camp	T39N., R19E., Sec. 5, NE¼NE¼
Browse Range	Denio	T39½N., R22E., Sec. 34, SW¼NW¼
Browse Range	Denio	T39½N., R22E., Sec. 31, NE¼SW¼
Browse Range	Denio	T39½N., R22E., Sec. 34, NE¼SW¼
Browse Range	Denio	T39½N., R22E., Sec. 29, SE¼NE¼
Browse Range	Bare Ranch	T37N., R22E., Sec. 32, SW¼NE¼
Browse Range	Bare Ranch	T36N., R22E., Sec. 5, SW¼NW¼
Browse Range	Bare Ranch	T38N., R23E., Sec. 31, SW¼SW¼
Browse Range	Bare Ranch	T38N., R23E., Sec. 31, NW¼NE¼
Browse Range	Bare Ranch	T37N., R22E., Sec. 23, NW¼SW¼
Browse Range	Bare Ranch	T37N., R22E., Sec. 33, NW¼NE¼
Browse Range	Tuledad	T36N., R16E., Sec. 1, NW¼SE¼
Browse Range	Tuledad	T36N., R16E., Sec. 13, NE¼NW¼
Browse Range	Tuledad	T38N., R17E., Sec. 32, NE¼SW¼
Browse Range	Tuledad	T38N., R17E., Sec. 32, SE¼SE¼
Browse Range	Tuledad	T37N., R17E., Sec. 18, SE¼NE¼
Browse Range	Tuledad	T37N., R17E., Sec. 22, NE¼SW¼
Browse Range	Tuledad	T37N., R17E., Sec. 21, NW¼SW¼
Browse Range	Tuledad	T37N., R17E., Sec. 2, SE¼SW¼
Browse Range	Tuledad	T37N., R17E., Sec. 3, NE¼SW¼
Browse Range	Tuledad	T37N., R17E., Sec. 9, NE¼SW¼
Browse Range	Tuledad	T35N., R18E., Sec. 27, SW¼NE¼
Browse Range	Tuledad	T35N., R18E., Sec. 28, NE¼SE¼
Number 3	Home Camp	SW¼, SW¼, Sec. 9, T41N., R19E.
Number 4	Bicondoa	NW¼, NE¼, Sec. 11, T40N., R17E.
Number 5	Home Camp	NW¼, SE¼, Sec. 2, T41N., R20E.
Number 5	Home Camp	NE¼, SW¼, Sec. 11, T41N., R20E.
Number 5	Bare	NE¼, NE¼, Sec. 3, T38N., R22E.
Number 5	Bare	SE¼, NE¼, Sec. 32, T38N., R22E.
Number 6	Bare	SW¼, NE¼, Sec. 3, T36N., R19E.
Number 6	Lower Lake	SW¼, NW¼, Sec. 22, T38N., R18E.
Number 7	Tuledad	SE¼, SE¼, Sec. 4, T37N., R16E.
Number 7	Wall Canyon	SW¼, SE¼, Sec. 20, T39N., R20E.
Number 10	Lower Lake	SE¼, NW¼, Sec. 28, T40N., R17E.
Number 11	Bare	SE¼, SE¼, Sec. 17, T37N., R19E.
Number 11	Bare	NW¼, SE¼, Sec. 32, T37N., R19E.
Number 12	Tuledad	NE¼, NW¼, Sec. 25, T36N., R19E.
Number 12	Bare	SW¼, SW¼, Sec. 24, T36N., R19E.
Number 14	Home Camp	NE¼, NE¼, Sec. 6, T39½N., R19E.
Number 14	Home Camp	SE¼, NW¼, Sec. 13, T40N., R21E.
Number 15	Tuledad	SE¼, SE¼, Sec. 28, T38N., R17E.

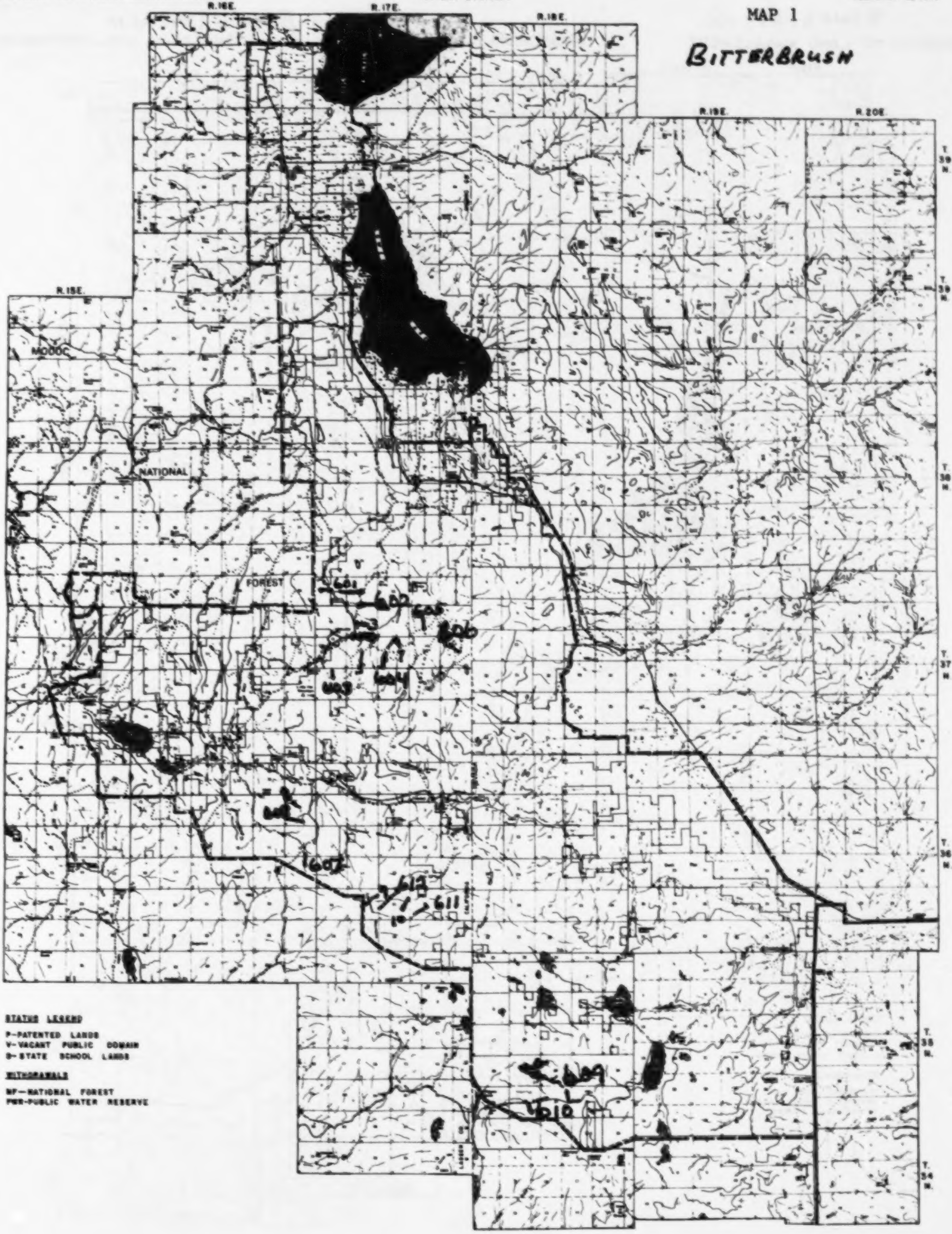
TABLE 1 (Continued)

Habitat Type	Allotment	Legal Description
Number 15	Tuledad	NE¼, NW¼, Sec. 28, T38N., R17E.
Number 15	Tuledad	NW¼, NW¼, Sec. 33, T38N., R17E.
Number 15	Tuledad	SE¼, NW¼, Sec. 32, T38N., R17E.
Number 15	Tuledad	NE¼, SE¼, Sec. 23, T37N., R15E.
Number 17	Duck Lake	SW¼, NE¼, Sec. 15, T38N., R19E.
Number 17	Home Camp	NE¼, NE¼, Sec. 28, T39N., R20E.
Number 19	Tuledad	NE¼, SE¼, Sec. 15, T37N., R16E.
Number 20	Home Camp	NE¼, SW¼, Sec. 18, T41N., R20E.
Number 20	Home Camp	NE¼, SE¼, Sec. 12, T37N., R20E.
Number 21	Bare	SW¼, NE¼, Sec. 12, T37N., R21E.
Number 21	Wall Canyon	NE¼, SE¼, Sec. 18, T39N., R21E.
Number 21	Bare	Center of Sec. 15, T37N., R21E.
Number 23	Tuledad	Center of Sec. 12, T35N., R18E.

BUREAU OF LAND MANAGEMENT CALIFORNIA FEBRUARY 8, 1973

MAP 1

BITTERBRUSH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R.19E.
R.20E.
R.15E.
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T. 39 N.
T. 38 N.
T. 37 N.
T. 36 N.
T. 35 N.
T. 34 N.
MODOC
NATIONAL
FOREST
601
602
605
606
603
604
608
607
612
611
609
610
STATUS LEGEND
P-PATENTED LANDS
V-VACANT PUBLIC DOMAIN
S-STATE SCHOOL LANDS
WITHDRAWALS
NF—NATIONAL FOREST
PWR-PUBLIC WATER RESERVE

DRAWING NUMBER: 04-020-08-3

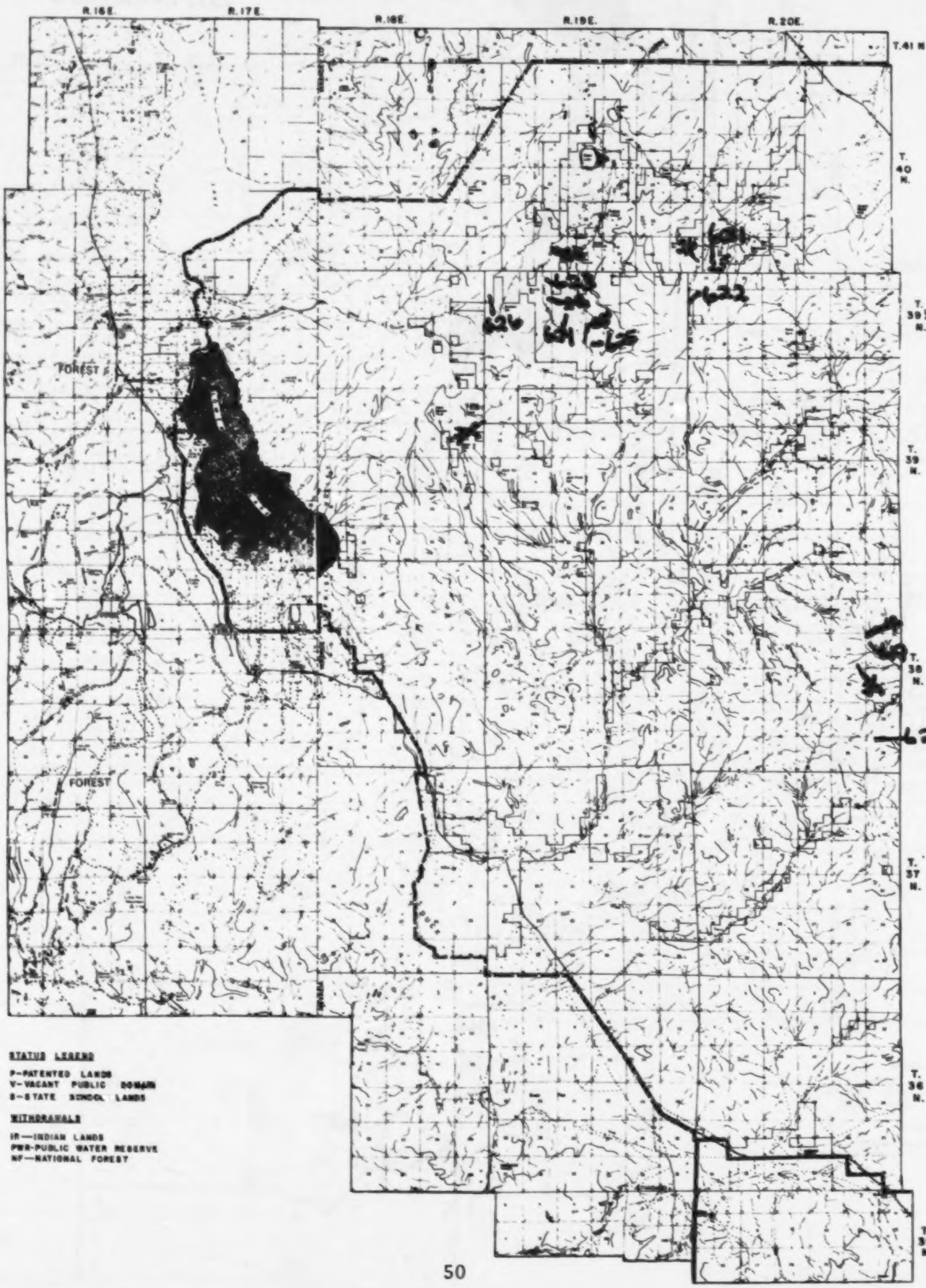
MT. DIABLO MERIDIAN 1/4" = 1 MILE 02-08 TULEDAD PLANNING UNIT

DRAWING NUMBER:04-020-09-5

MAP 2

BITTERBRUSH

BUREAU OF LAND MANAGEMENT CALIFORNIA FEBRUARY 6, 1973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T. 38 N.
T. 37 N.
T. 36 N.
T. 35 N.
FOREST
FOREST
621
622
626
624
625
620
STATUS LEGEND
P-PATENTED LANDS
V-VACANT PUBLIC DOMAIN
S-STATE SCHOOL LANDS
WITHDRAWALS
IR—INDIAN LANDS
PWR-PUBLIC WATER RESERVE
NF—NATIONAL FOREST

MT. DIABLO MERIDIAN 1/4" = 1 MILE 02-09 HOME CAMP PLANNING UNIT SHEET 1 of 2

DRAWING NUMBER:04-020-09-6

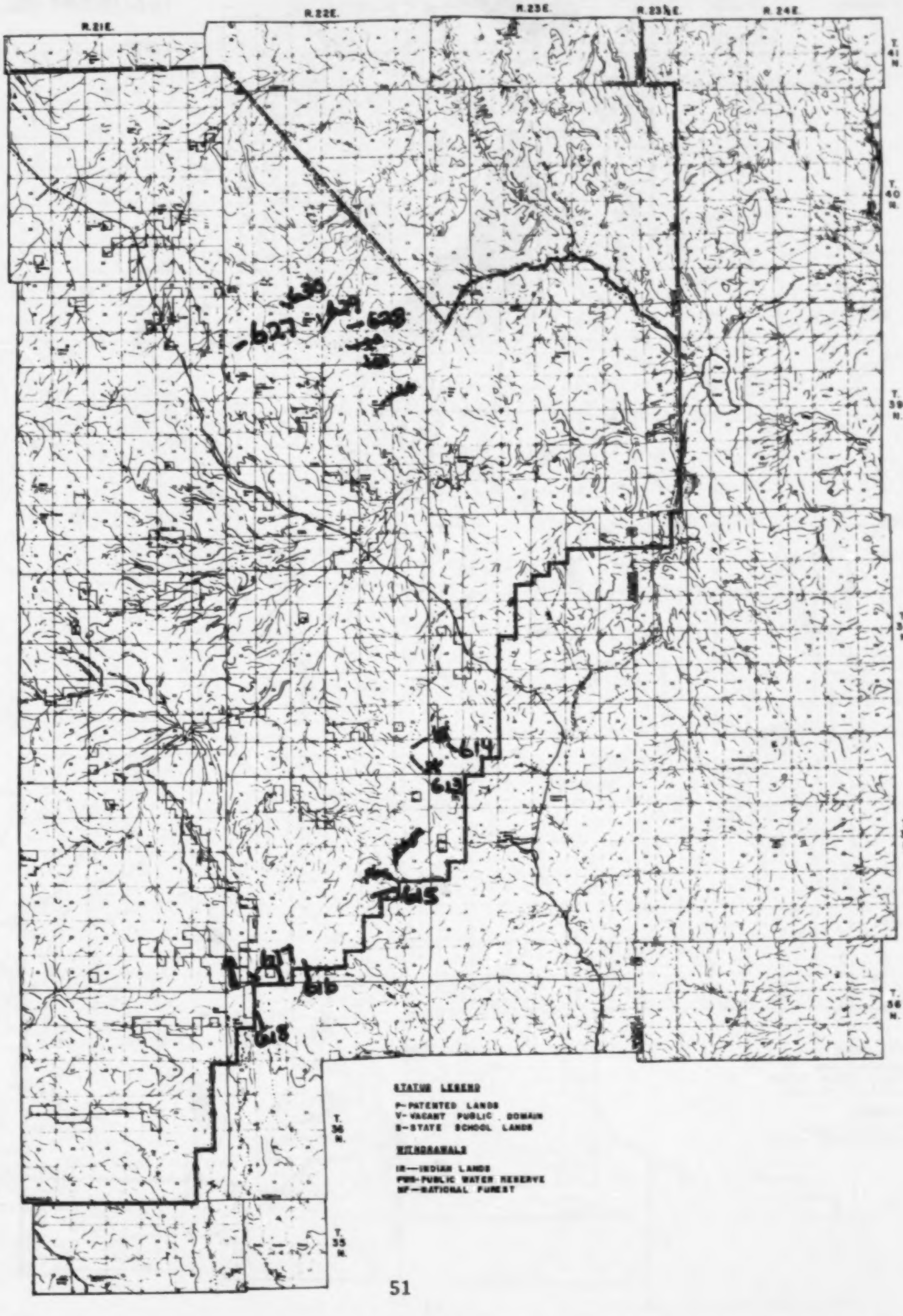
MAP 3

Bitterbrush

BUREAU OF LAND MANAGEMENT

CALIFORNIA

FEBRUARY 6, 1973



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T. 39 N.
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T. 37 N.
T. 36 N.
T. 36 N.
T. 35 N.
630
629
627
628
614
613
615
617
616
618
STATUS LEGEND
P-PATENTED LANDS
V-VACANT PUBLIC DOMAIN
S-STATE SCHOOL LANDS
WITHDRAWALS
IR—INDIAN LANDS
PWR-PUBLIC WATER RESERVE
NF—NATIONAL FOREST

MT. DIABLO MERIDIAN

1/4" = 1 MILE

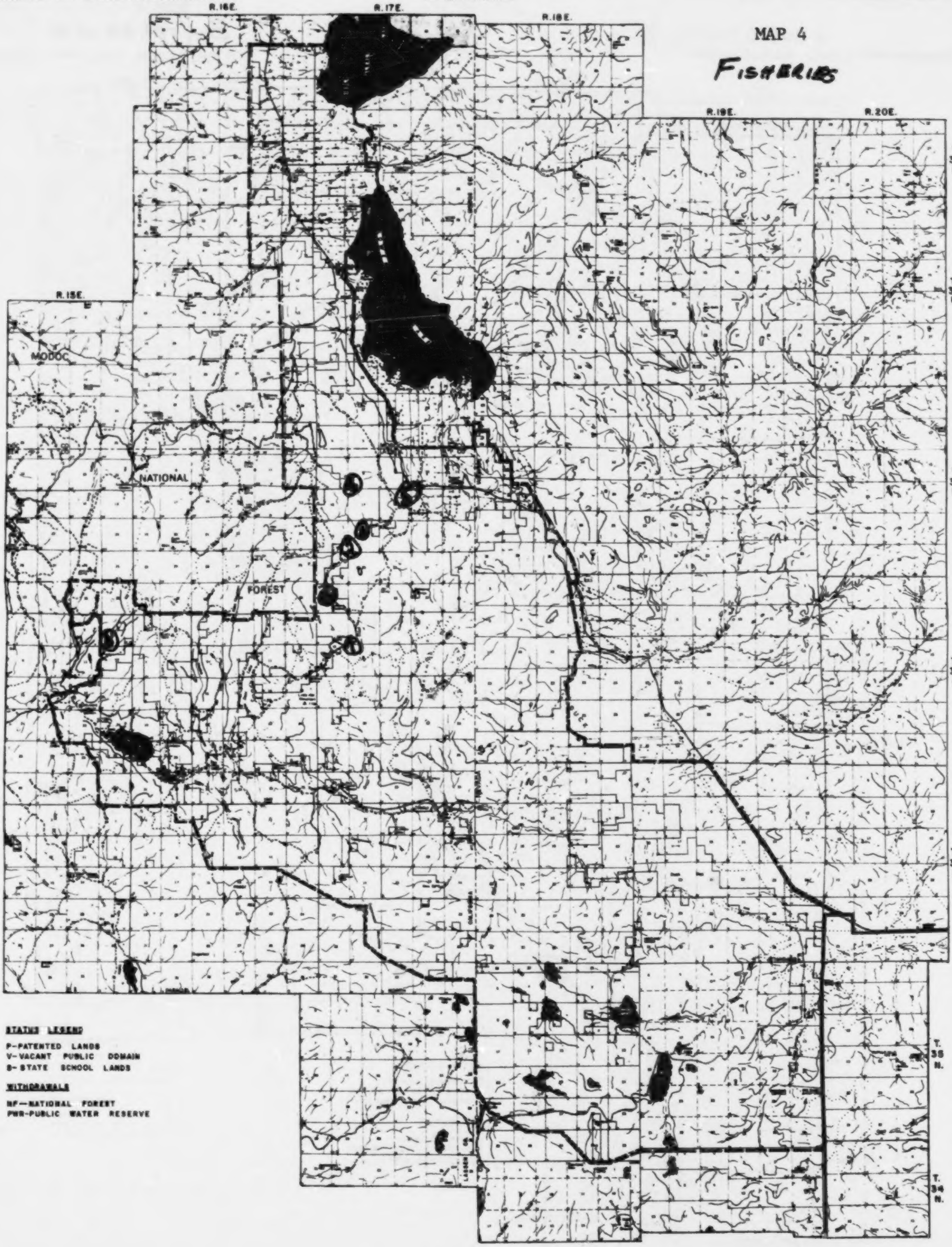
02-09

HOME CAMP PLANNING UNIT SHEET 2 of 2

BUREAU OF LAND MANAGEMENT CALIFORNIA FEBRUARY 2, 1973

MAP 4

FISHERIES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T. 37 N.
T. 36 N.
T. 35 N.
T. 34 N.
MODOC
NATIONAL
FOREST
STATUS LEGEND
P-PATENTED LANDS
V-VACANT PUBLIC DOMAIN
S-STATE SCHOOL LANDS
WITHDRAWALS
NF—NATIONAL FOREST
PWR-PUBLIC WATER RESERVE

DRAWING NUMBER:04-020-08-3

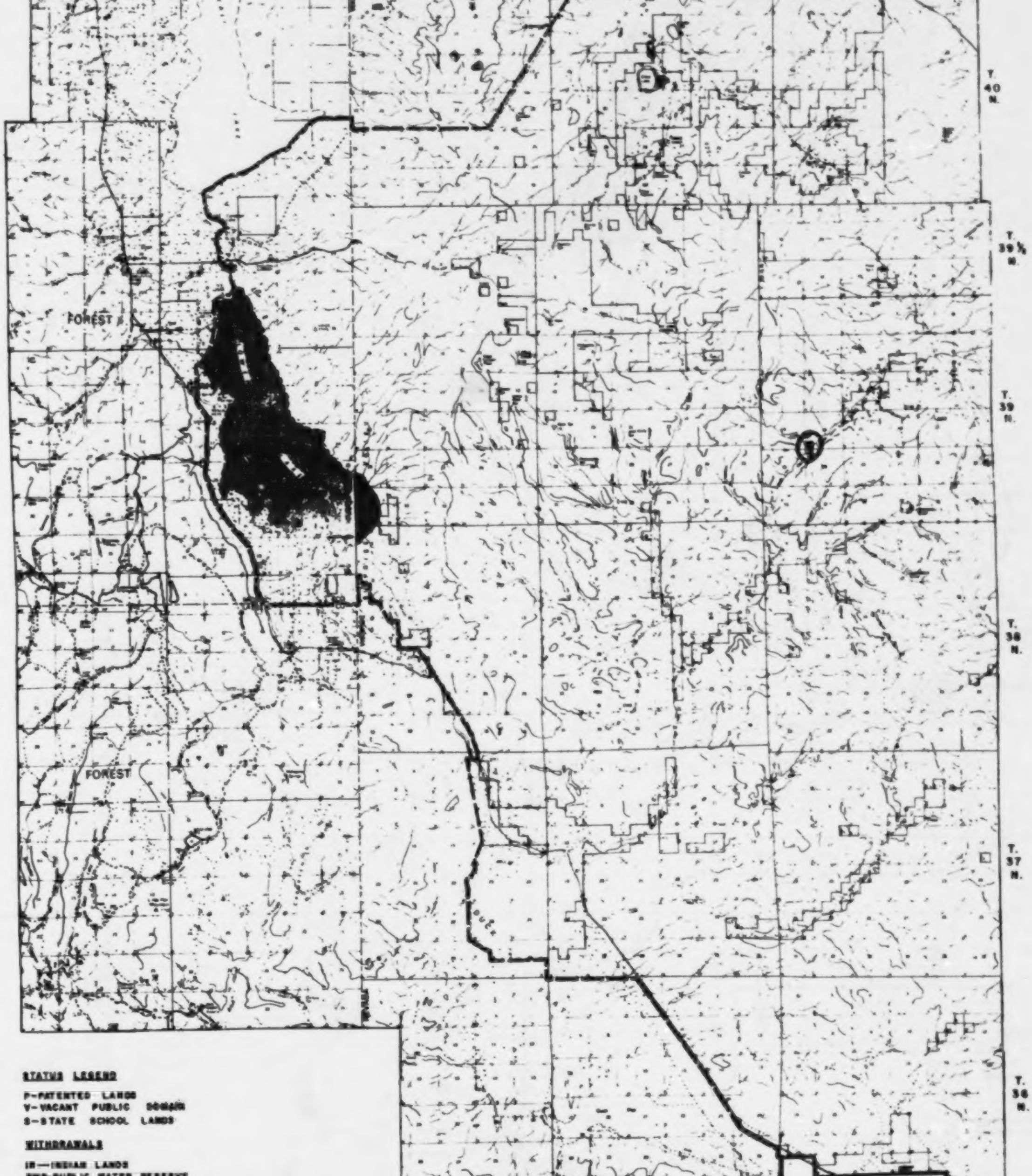
MT. DIABLO MERIDIAN 1/4" = 1 MILE TULEDAD PLANNING UNIT

DRAWING NUMBER: 04-020-09-5

MAP 5

FISHERIES

BUREAU OF LAND MANAGEMENT CALIFORNIA FEBRUARY 6, 1973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R.20E.
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T. 39½ N.
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T. 38 N.
T. 37 N.
T. 36 N.
T. 35 N.
FOREST
FOREST
STATUS LEGEND
P-PATENTED LANDS
V-VACANT PUBLIC DOMAIN
S-STATE SCHOOL LANDS
WITHDRAWALS
IR—INDIAN LANDS
PWR-PUBLIC WATER RESERVE
NF—NATIONAL FOREST

MT. DIABLO MERIDIAN 1/4" = 1 MILE 02-09 HOME CAMP PLANNING UNIT SHEET 1 of 2

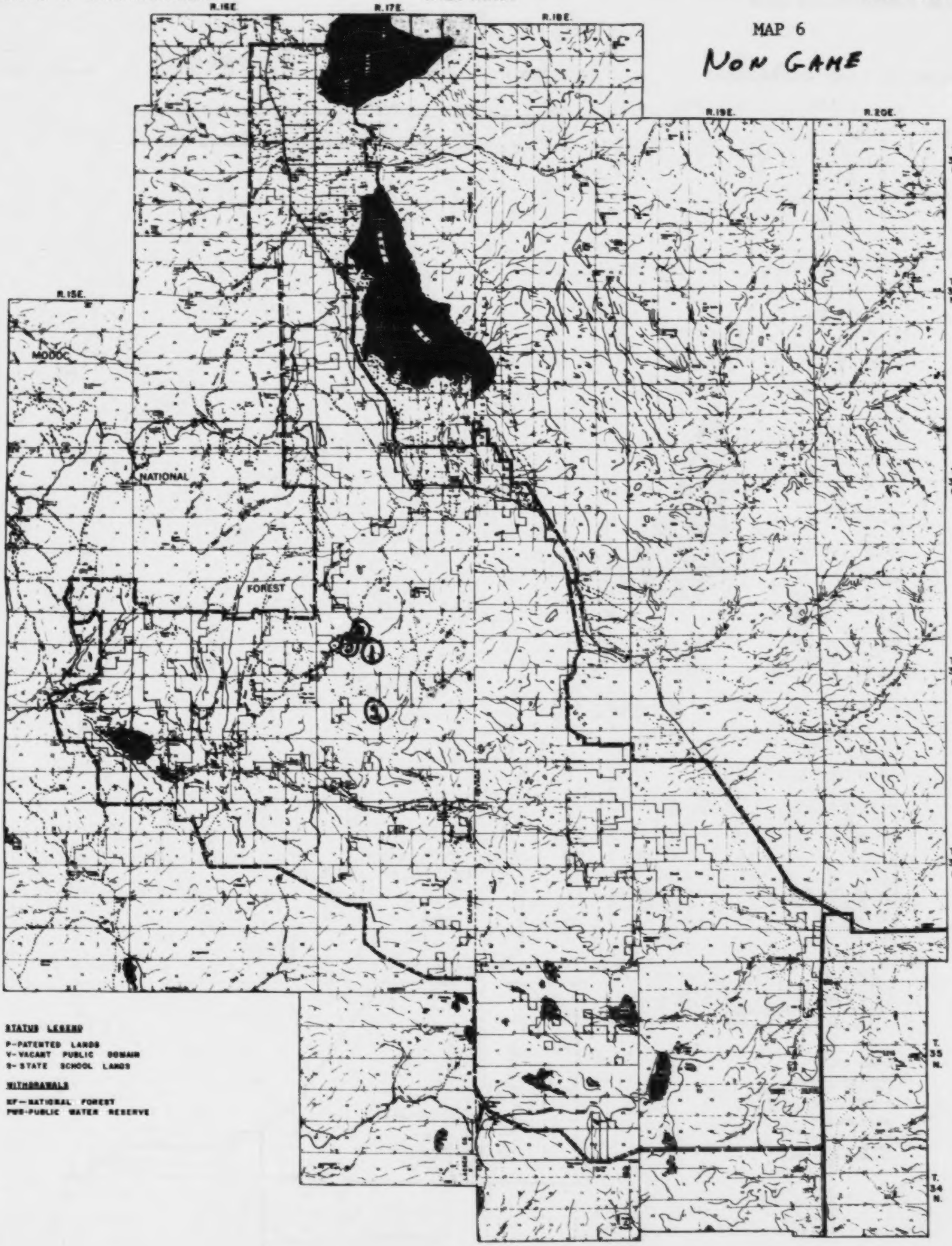
BUREAU OF LAND MANAGEMENT

CALIFORNIA

FEBRUARY 2, 1973

MAP 6

Non Game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R.20E.
R.15E.
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T. 37 N.
T. 36 N.
T. 35 N.
T. 34 N.
MODOC
NATIONAL
FOREST
CALIFORNIA

STATUS LEGEND

P-PATENTED LANDS
V-VACANT PUBLIC DOMAIN
S-STATE SCHOOL LANDS

WITHDRAWALS

NF—NATIONAL FOREST
PWR-PUBLIC WATER RESERVE

DRAWING NUMBER: 04-020-08-3

MT. DIABLO MERIDIAN

1/4" = 1 MILE

02-08

TULEDAD PLANNING UNIT

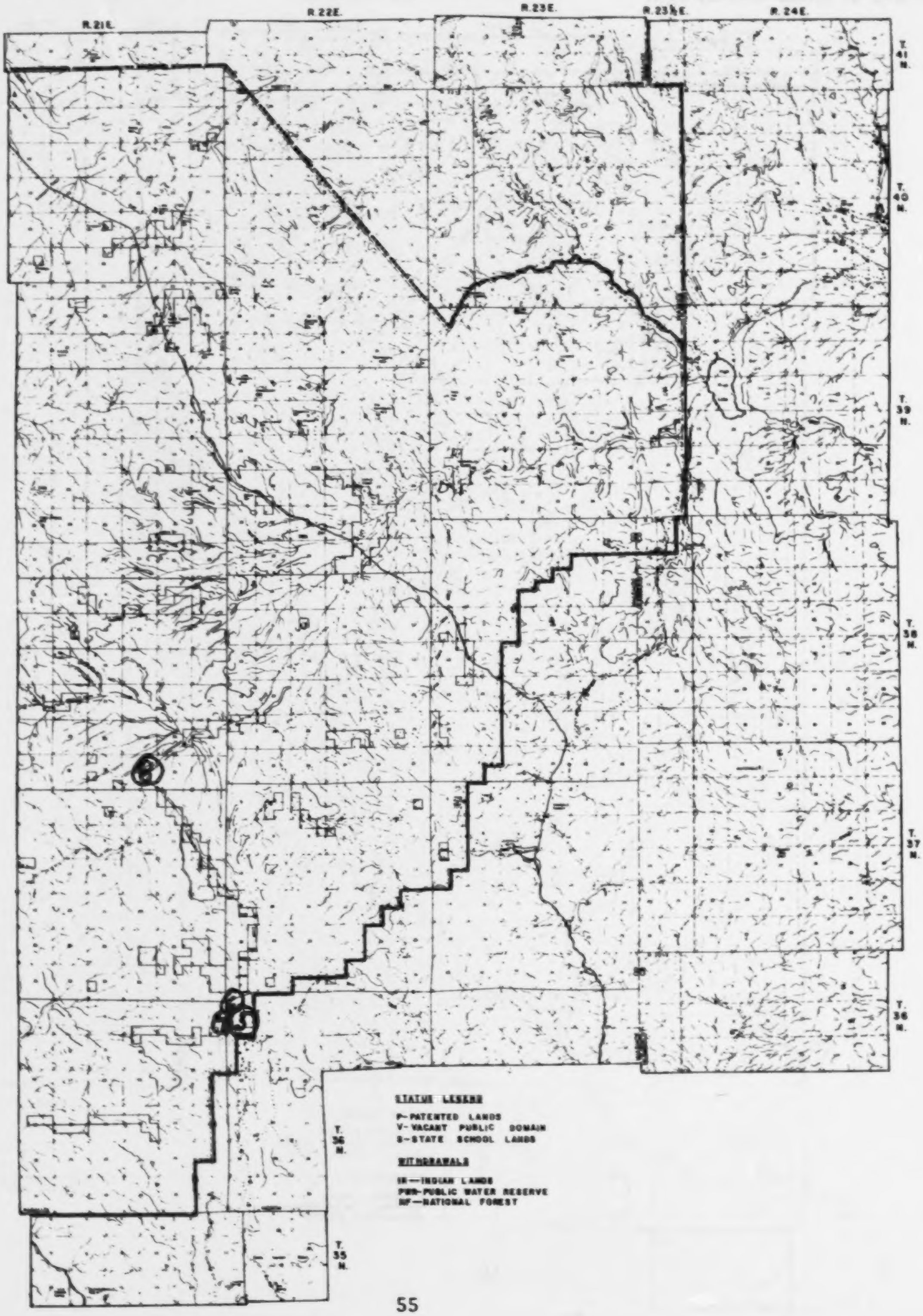
DRAWING NUMBER: 04-020-09-6

MAP 7

BUREAU OF LAND MANAGEMENT

CALIFORNIA

NON-GAME FEBRUARY 6, 1978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R. 24 E.
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T. 37 N.
T. 36 N.
T. 36 N.
T. 35 N.
STATUS LEGEND
P—PATENTED LANDS
V—VACANT PUBLIC DOMAIN
S—STATE SCHOOL LANDS
WITHDRAWALS
IR—INDIAN LANDS
PWR—PUBLIC WATER RESERVE
NF—NATIONAL FOREST

MT. DIABLO MERIDIAN 1/4" = 1 MILE 02-09 HOME CAMP PLANNING UNIT SHEET 2 of 2

DRAWING NUMBER:04-020-09-6

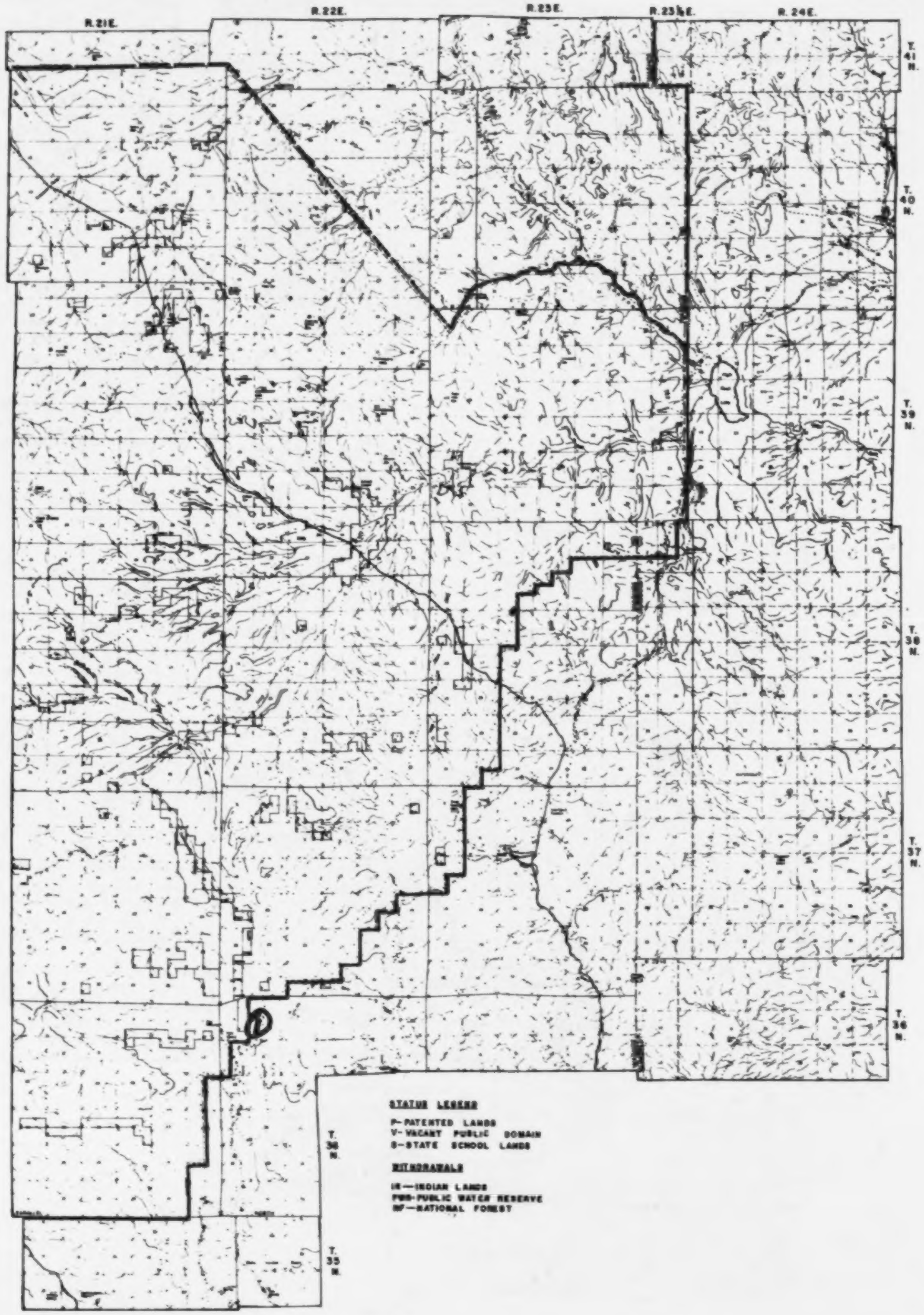
Mountain Mahogany

MAP 8

BUREAU OF LAND MANAGEMENT

CALIFORNIA

FEBRUARY 6, 1973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R.24E.
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T. 39 N.
T. 38 N.
T. 37 N.
T. 36 N.
T. 36 N.
T. 35 N.
1

STATUS LEGEND

P–PATENTED LANDS
V–VACANT PUBLIC DOMAIN
S–STATE SCHOOL LANDS

WITHDRAWALS

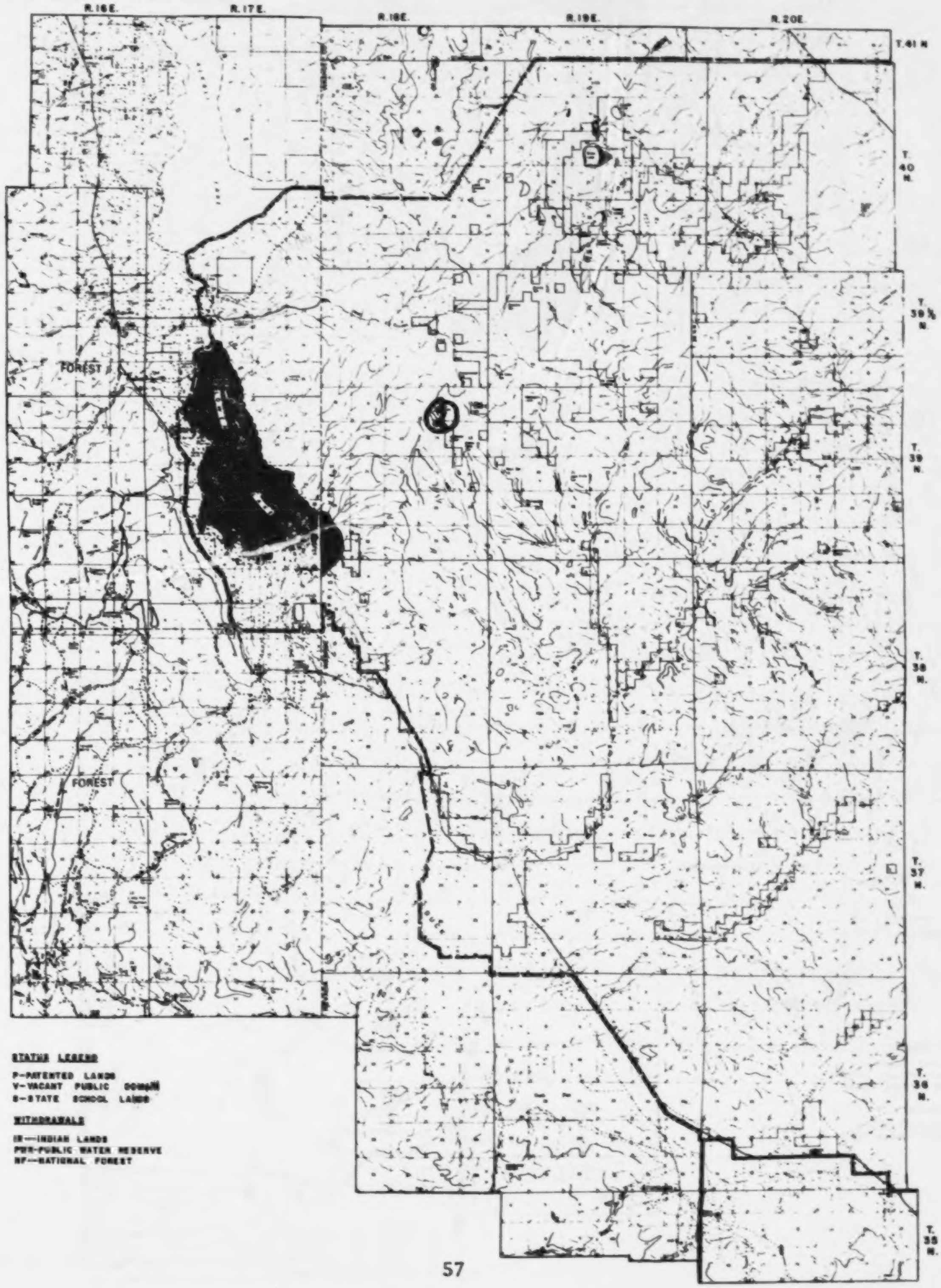
IR—INDIAN LANDS
PWR-PUBLIC WATER RESERVE
NF—NATIONAL FOREST

MT. DIABLO MERIDIAN 1/4" = 1 MILE 02-09 HOME CAMP PLANNING UNIT SHEET 2 of 2

AWING NUMBER:04-020-09-5

MAP 9

BUREAU OF LAND MANAGEMENT CALIFORNIA Mountain Mahogany FEBRUARY 6, 1973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R.19E.
R.20E.
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T. 38 N.
T. 37 N.
T. 36 N.
T. 35 N.
FOREST
FOREST

STATUS LEGEND

P—PATENTED LANDS
V—VACANT PUBLIC DOMAIN
S—STATE SCHOOL LANDS

WITHDRAWALS

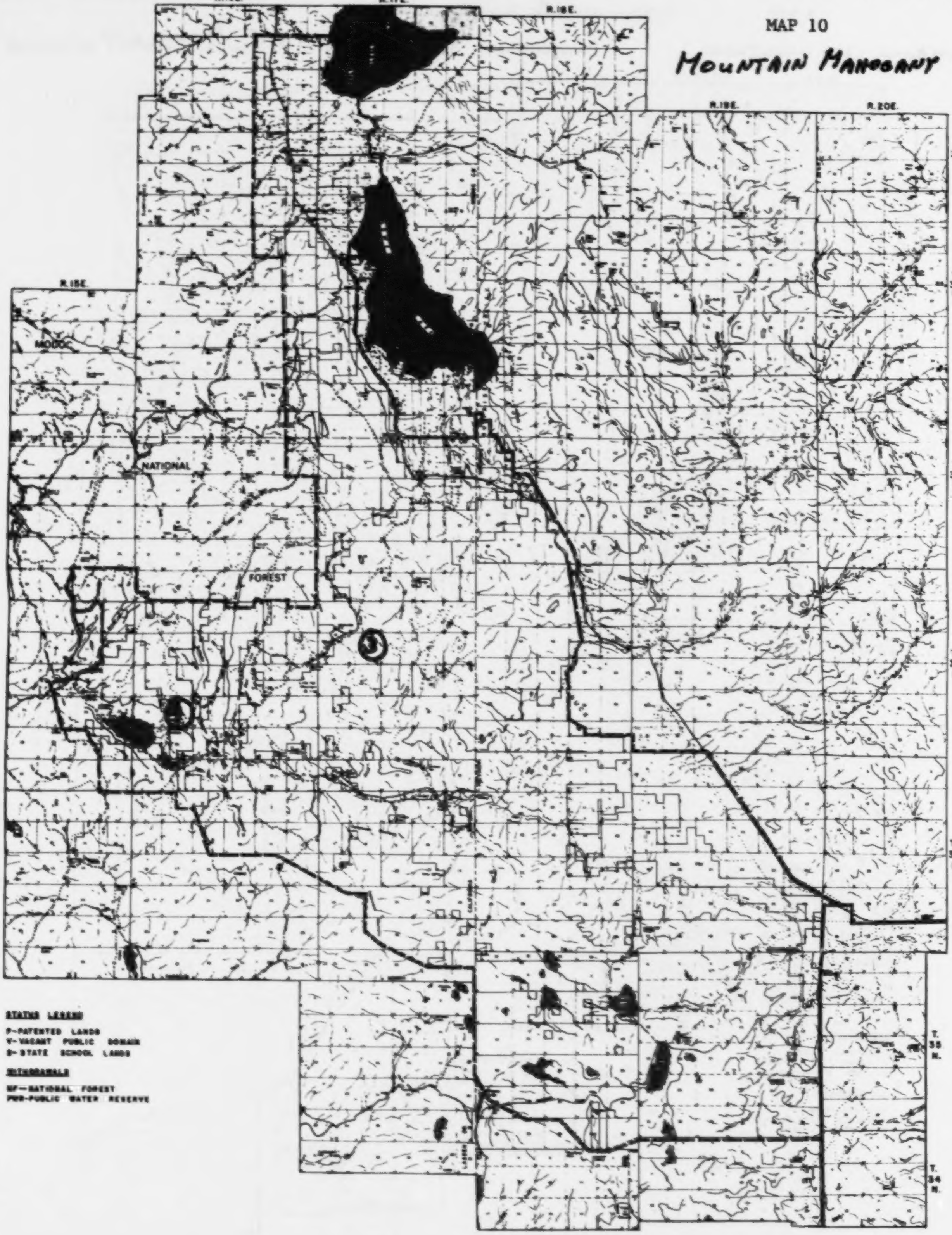
IR—INDIAN LANDS
PWR-PUBLIC WATER RESERVE
NF—NATIONAL FOREST

MT. DIABLO MERIDIAN 1/4" = 1 MILE 02-09 HOME CAMP PLANNING UNIT SHEET 1 of 2

BUREAU OF LAND MANAGEMENT CALIFORNIA FEBRUARY 2, 1973

MAP 10

Mountain Mahogany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R.18E.
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R.20E.
R.15E.
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T.39N.
T.38N.
T.37N.
T.36N.
T.35N.
T.34N.
MODOC
NATIONAL
FOREST
S
A

STATUS LEGEND

P-PATENTED LANDS
V-VACANT PUBLIC DOMAIN
S-STATE SCHOOL LANDS

WITHDRAWALS

NF-NATIONAL FOREST
PWR-PUBLIC WATER RESERVE

DRAWING NUMBER:04-020-06-3

MT. DIABLO MERIDIAN 1/4" = 1 MILE TULEDAD PLANNING UNIT

DRAWING NUMBER:04-020-09-6

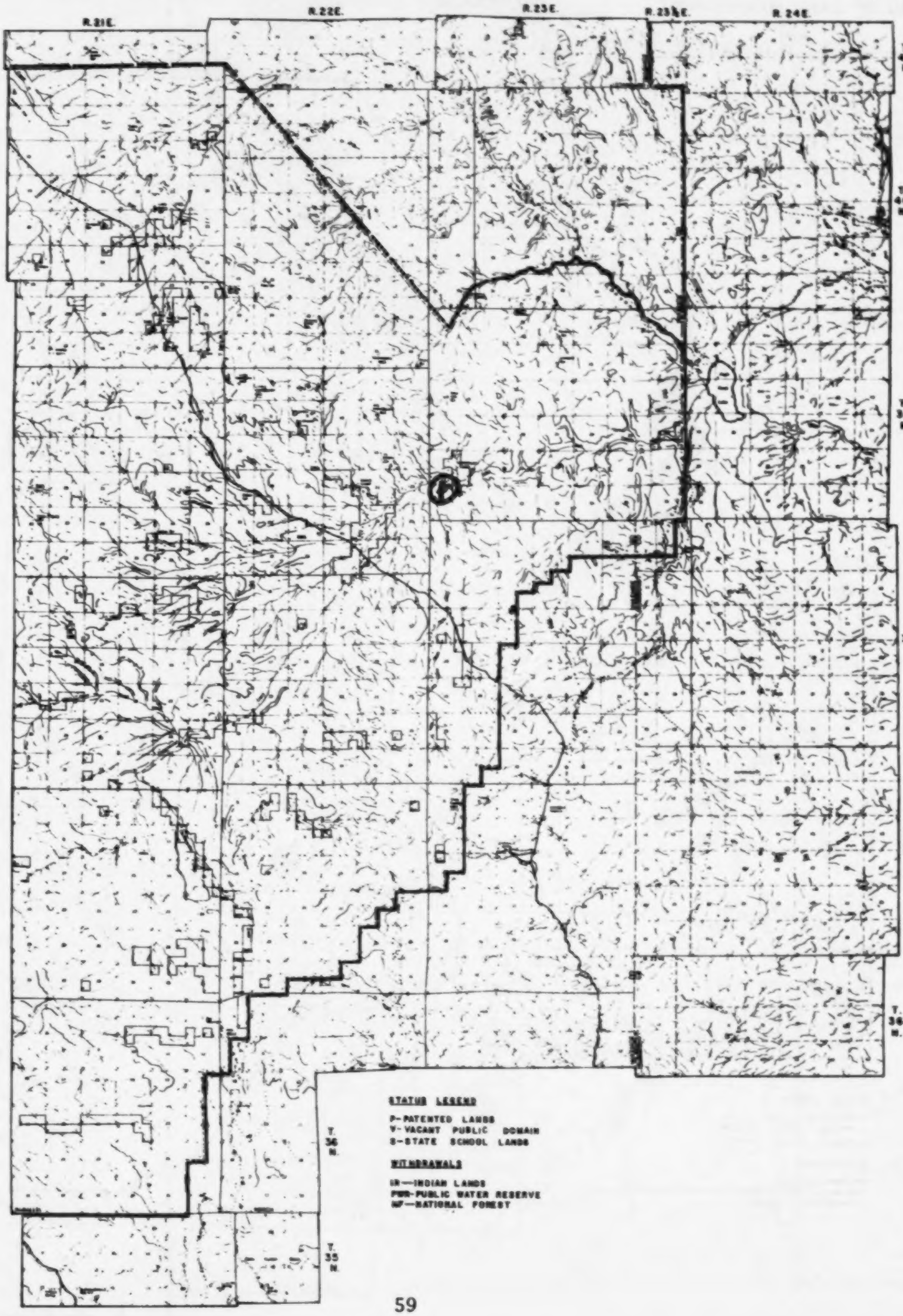
WATERFOWL

MAP 11

BUREAU OF LAND MANAGEMENT

CALIFORNIA

FEBRUARY 6, 1975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R.24E.
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T. 36 N.
T. 36 N.
T. 35 N.
STATUS LEGEND
P-PATENTED LANDS
V-VACANT PUBLIC DOMAIN
S-STATE SCHOOL LANDS
WITHDRAWALS
IR—INDIAN LANDS
PWR-PUBLIC WATER RESERVE
NF—NATIONAL FOREST

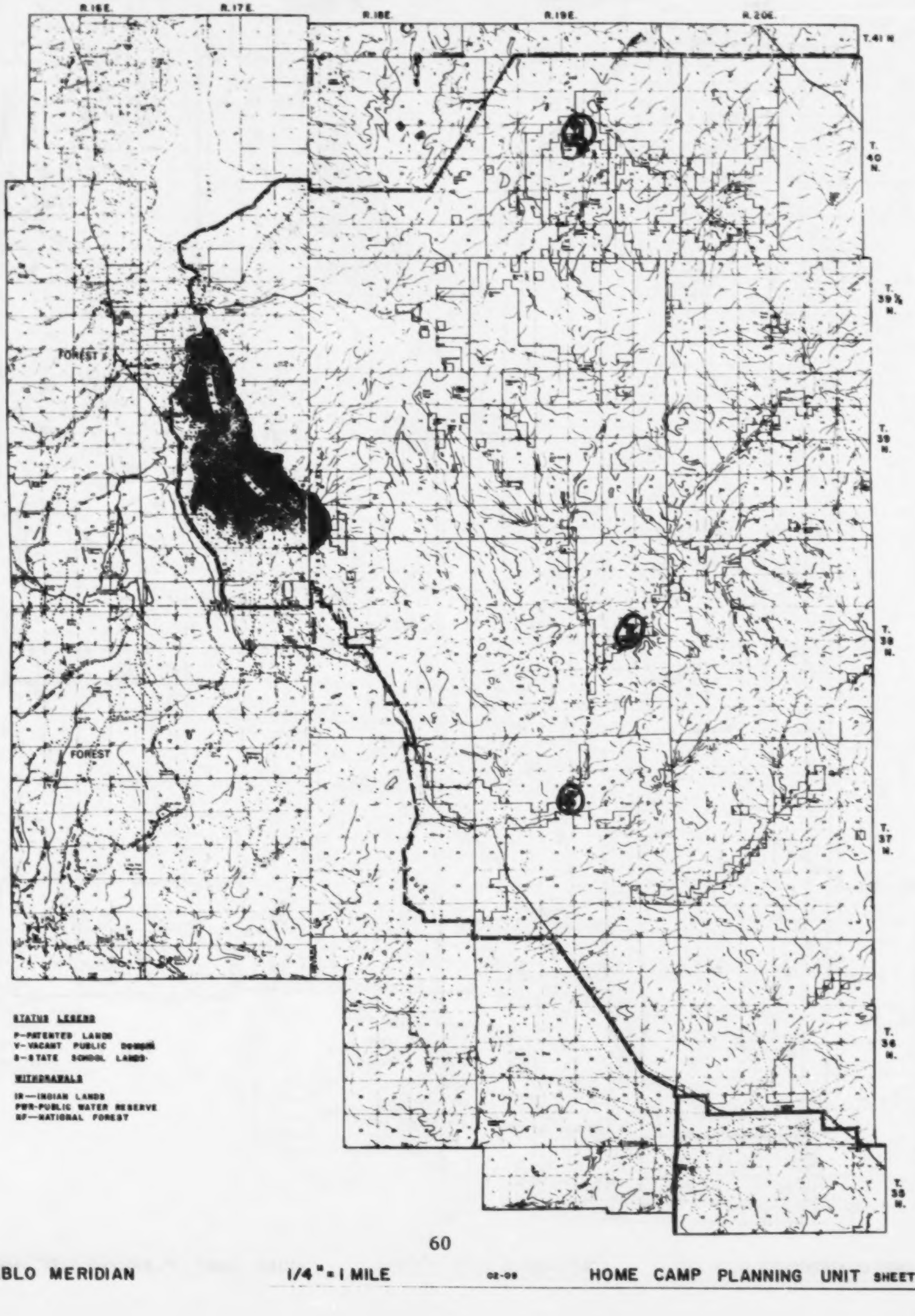
MT. DIABLO MERIDIAN 1/4" = 1 MILE 02-09 HOME CAMP PLANNING UNIT SHEET 2 of 2

DRAWING NUMBER:04-020-09-S

MAP 12

Waterfowl

BUREAU OF LAND MANAGEMENT CALIFORNIA FEBRUARY 6, 1973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R.18E.
R.19E.
R.20E.
T.41 N.
T. 40 N.
T. 39½ N.
T. 39 N.
T. 38 N.
T. 37 N.
T. 36 N.
T. 35 N.
FOREST
FOREST
STATUS LEGEND
P—PATENTED LANDS
V—VACANT PUBLIC DOMAIN
S—STATE SCHOOL LANDS
WITHDRAWALS
IR—INDIAN LANDS
PWR-PUBLIC WATER RESERVE
NF—NATIONAL FOREST

MT. DIABLO MERIDIAN 1/4" = 1 MILE 02-09 HOME CAMP PLANNING UNIT SHEET 1 of 2

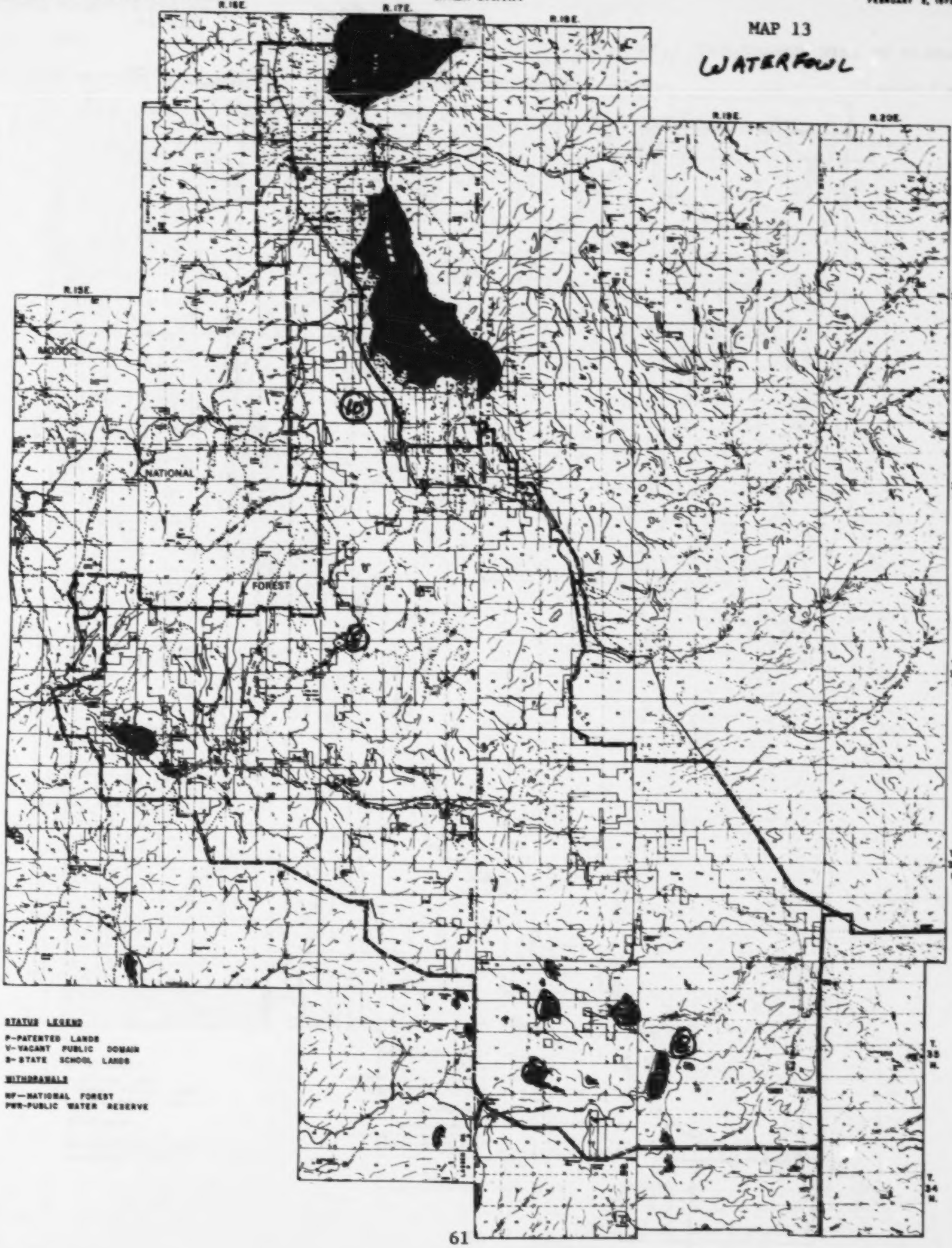
BUREAU OF LAND MANAGEMENT

CALIFORNIA

FEBRUARY 8, 1973

MAP 13

WATERFOWL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R.18E.
R.19E.
R.20E.
R.15E.
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T. 39 N.
T. 38 N.
T. 37 N.
T. 36 N.
T. 35 N.
T. 34 N.
MODOC
NATIONAL
FOREST
10

STATUS LEGEND

P-PATENTED LANDS
V-VACANT PUBLIC DOMAIN
S-STATE SCHOOL LANDS

WITHDRAWALS

NF—NATIONAL FOREST
PWR-PUBLIC WATER RESERVE

DRAWING NUMBER: 04-020-08-3

MT. DIABLO MERIDIAN

1/4" = 1 MILE

08-08

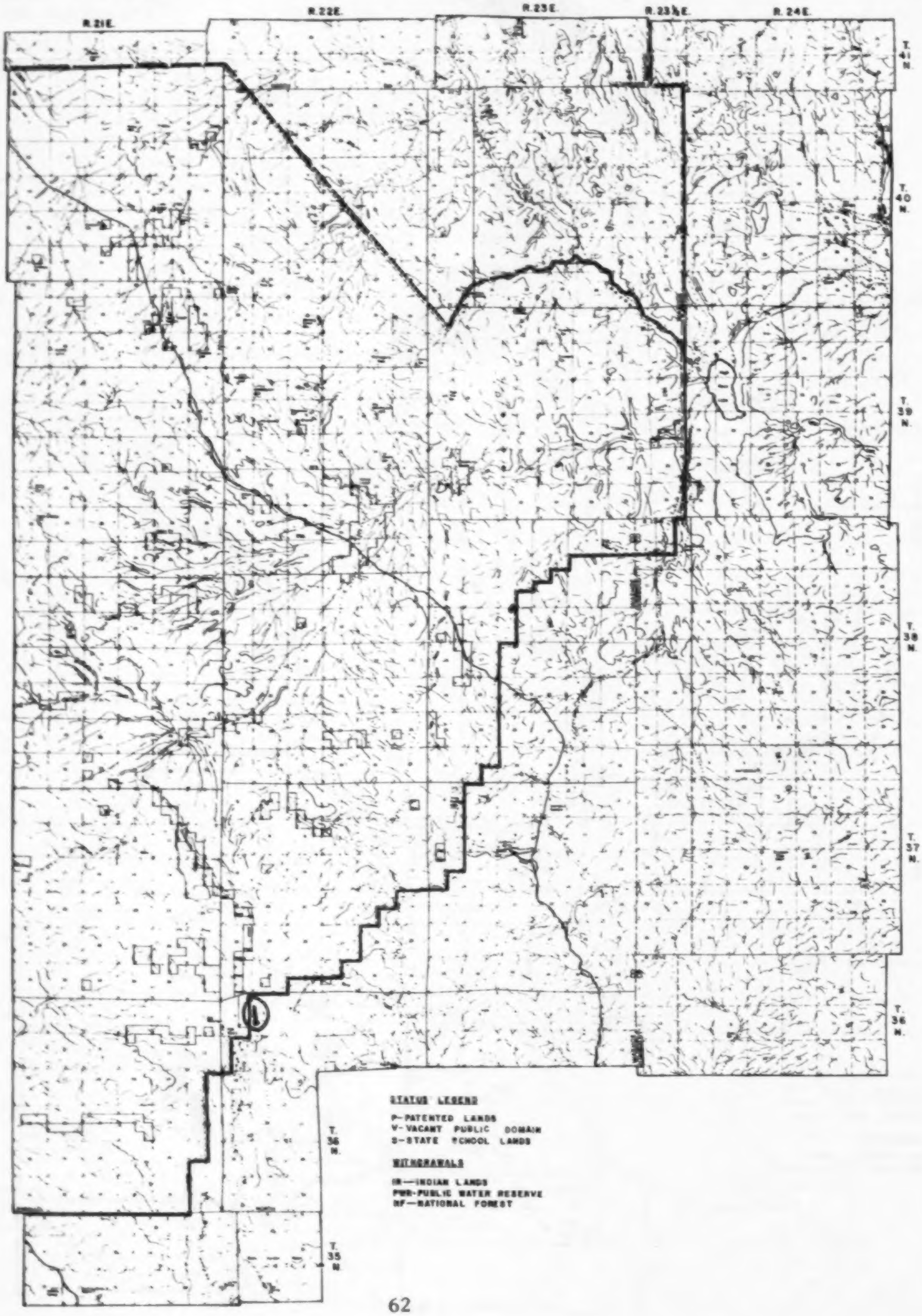
TULEDAD PLANNING UNIT

DRAWING NUMBER:04-020-09-6

Aspen

MAP 14

BUREAU OF LAND MANAGEMENT **CALIFORNIA** FEBRUARY 6, 1973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R.23E.
R.23½E.
R.24E.
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T. 40 N.
T. 39 N.
T. 38 N.
T. 37 N.
T. 36 N.
T. 36 N.
T. 35 N.
STATUS LEGEND
P—PATENTED LANDS
V—VACANT PUBLIC DOMAIN
S—STATE SCHOOL LANDS
WITHDRAWALS
IR—INDIAN LANDS
PWR-PUBLIC WATER RESERVE
NF—NATIONAL FOREST

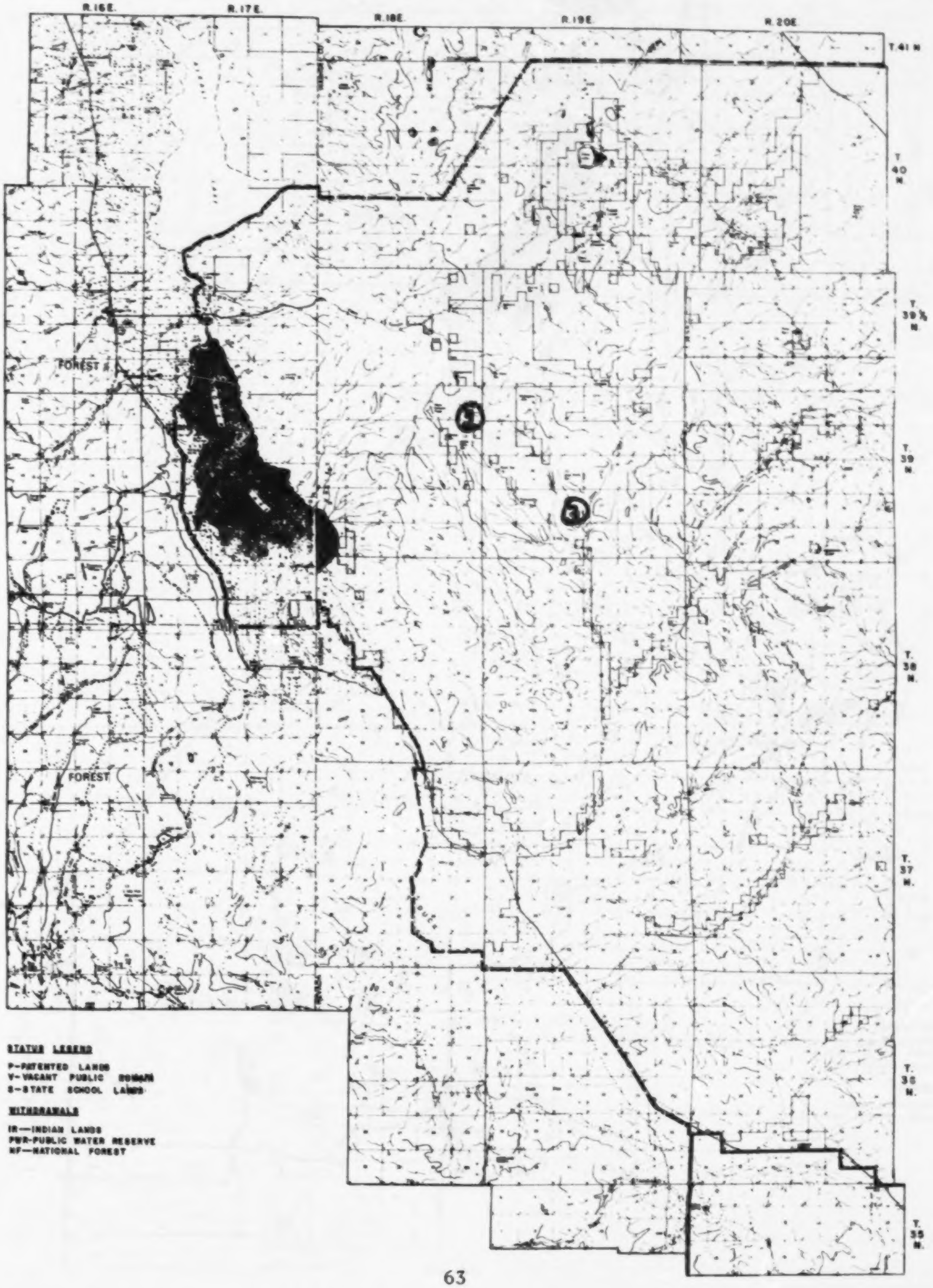
MT. DIABLO MERIDIAN 1/4" = 1 MILE 02-09 **HOME CAMP PLANNING UNIT** SHEET 2 of 2

DRAWING NUMBER:04-020-09-6

MAP 15

Aspen

BUREAU OF LAND MANAGEMENT CALIFORNIA FEBRUARY 6, 1973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T. 39½ N
T. 39 N.
T. 38 N.
T. 37 N.
T. 36 N.
T. 35 N.
FOREST
FOREST

STATUS LEGEND

P-PATENTED LANDS
V-VACANT PUBLIC DOMAIN
S-STATE SCHOOL LANDS

WITHDRAWALS

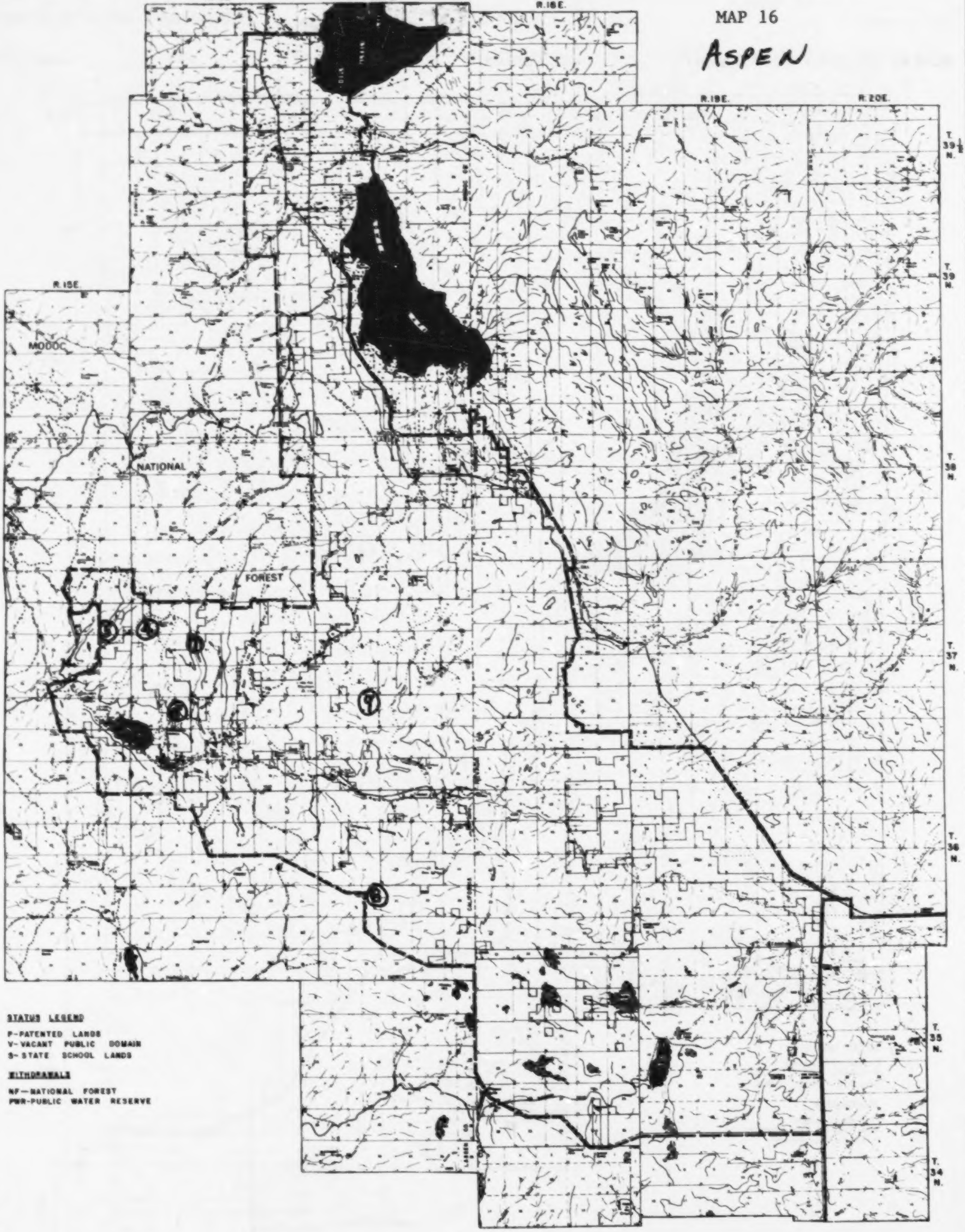
IR—INDIAN LANDS
PWR-PUBLIC WATER RESERVE
NF—NATIONAL FOREST

MT. DIABLO MERIDIAN 1/4"=1 MILE 02-09 HOME CAMP PLANNING UNIT SHEET 1 of 2

BUREAU OF LAND MANAGEMENT CALIFORNIA FEBRUARY 2, 1973

MAP 16

Aspen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T. 38 N.
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T. 36 N.
T. 35 N.
T. 34 N.
MODOC
NATIONAL
FOREST
STATUS LEGEND
P-PATENTED LANDS
V-VACANT PUBLIC DOMAIN
S-STATE SCHOOL LANDS
WITHDRAWALS
NF—NATIONAL FOREST
PWR-PUBLIC WATER RESERVE

DRAWING NUMBER: 04-020-08-3

MT. DIABLO MERIDIAN 1/4"=1MILE 08-08 TULEDAD PLANNING UNIT

DRAWING NUMBER:04-020-09-6

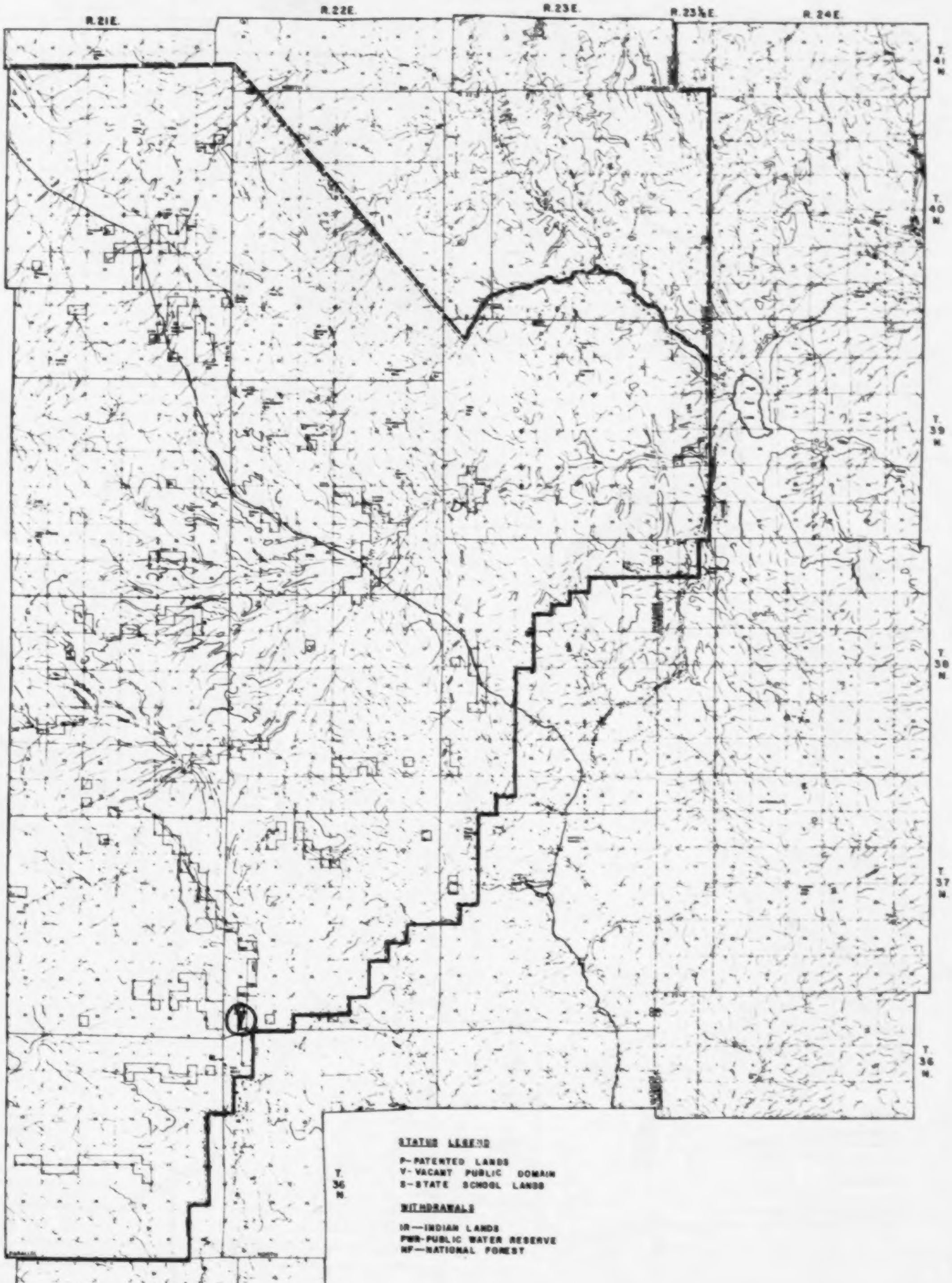
Willow Riparian

MAP 17

BUREAU OF LAND MANAGEMENT

CALIFORNIA

FEBRUARY 6, 1973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R.23½E.
R.24E.
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T. 38 N.
T. 37 N.
T. 36 N.
T. 36 N.
T. 35 N.
STATUS LEGEND
P—PATENTED LANDS
V—VACANT PUBLIC DOMAIN
S—STATE SCHOOL LANDS
WITHDRAWALS
IR—INDIAN LANDS
PWR—PUBLIC WATER RESERVE
NF—NATIONAL FOREST

MT. DIABLO MERIDIAN

1/4" = 1 MILE

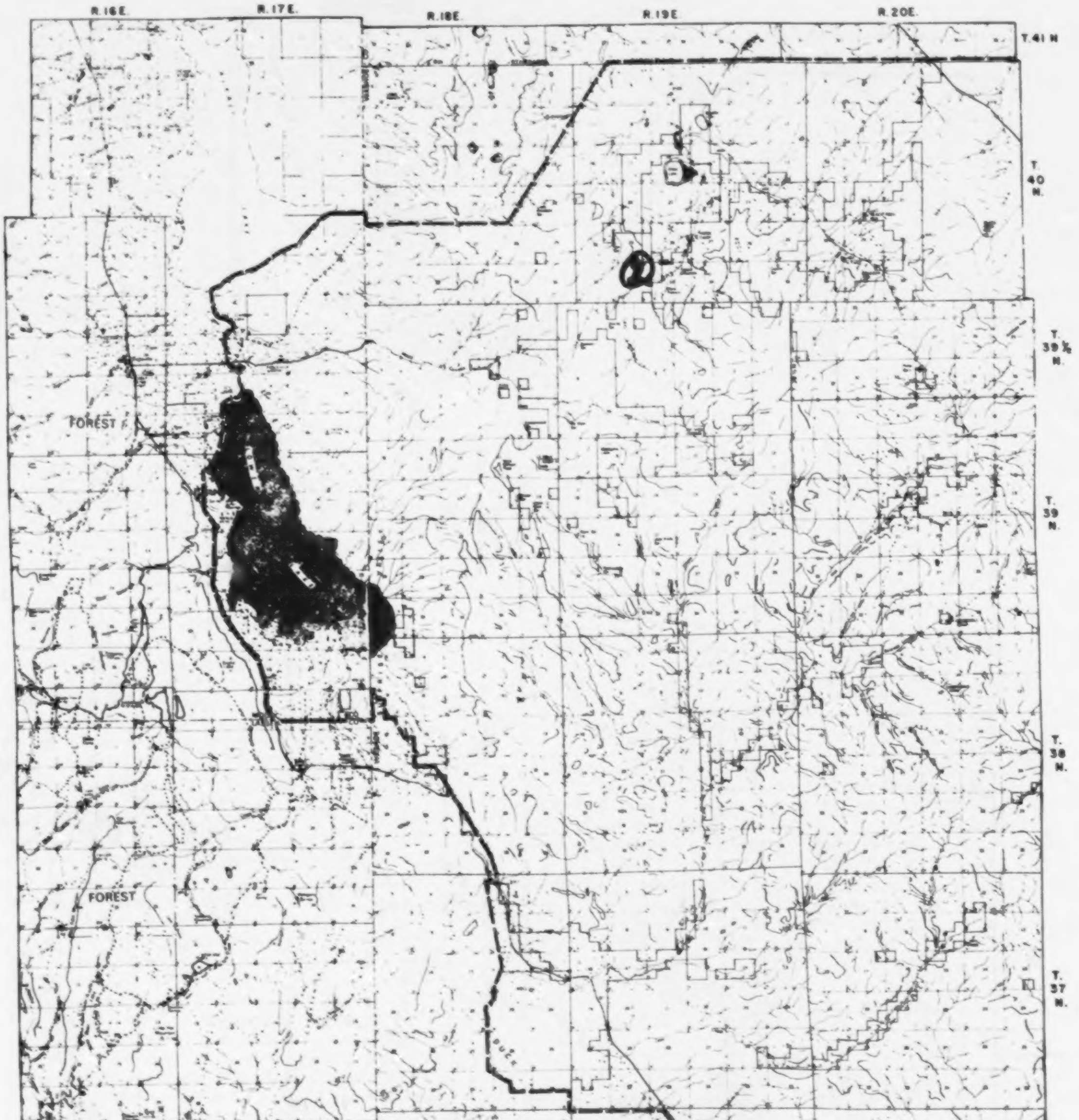
HOME CAMP PLANNING UNIT SHEET 2 of 2

DRAWING NUMBER:04-020-09-5

MAP 18

Willow Riparian

BUREAU OF LAND MANAGEMENT CALIFORNIA FEBRUARY 6, 1973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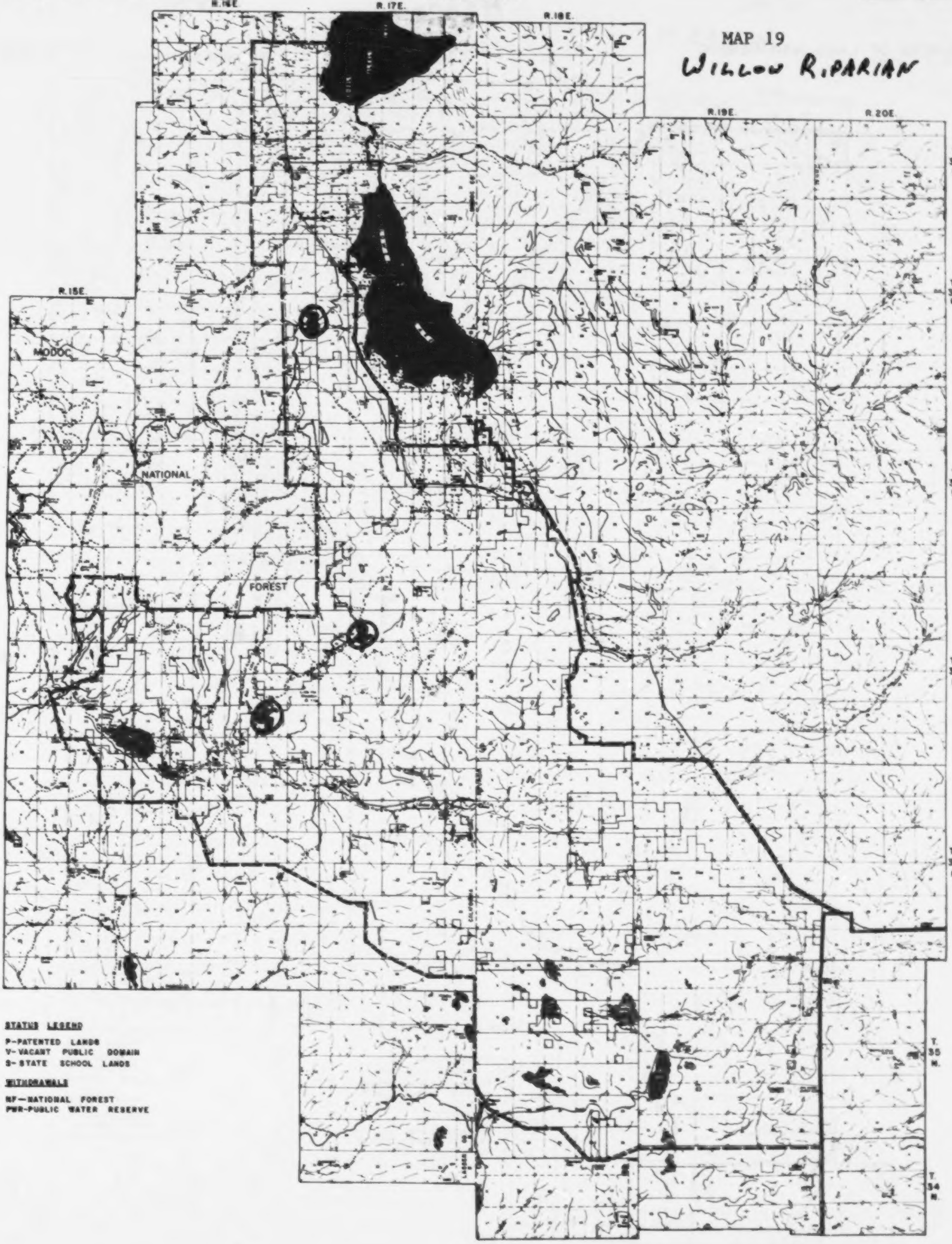
T.35 N.
FOREST
FOREST
STATUS LEGEND
P-PATENTED LANDS
V-VACANT PUBLIC DOMAIN
S-STATE SCHOOL LANDS
WITHDRAWALS
IR—INDIAN LANDS
PWR-PUBLIC WATER RESERVE
NF—NATIONAL FOREST

MT. DIABLO MERIDIAN 1/4" = 1 MILE 02-09 HOME CAMP PLANNING UNIT SHEET 1 of 2

BUREAU OF LAND MANAGEMENT **CALIFORNIA** FEBRUARY 2, 1973

MAP 19

Willow Riparian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T. 36 N.
T. 35 N.
T. 34 N.
MODOC
NATIONAL
FOREST
STATUS LEGEND
P-PATENTED LANDS
V-VACANT PUBLIC DOMAIN
S-STATE SCHOOL LANDS
WITHDRAWALS
NF—NATIONAL FOREST
PWR-PUBLIC WATER RESERVE

DRAWING NUMBER:04-020-08-3

MT. DIABLO MERIDIAN **1/4"=1MILE** **TULEDAD PLANNING UNIT**

DRAWING NUMBER:04-020-09-6

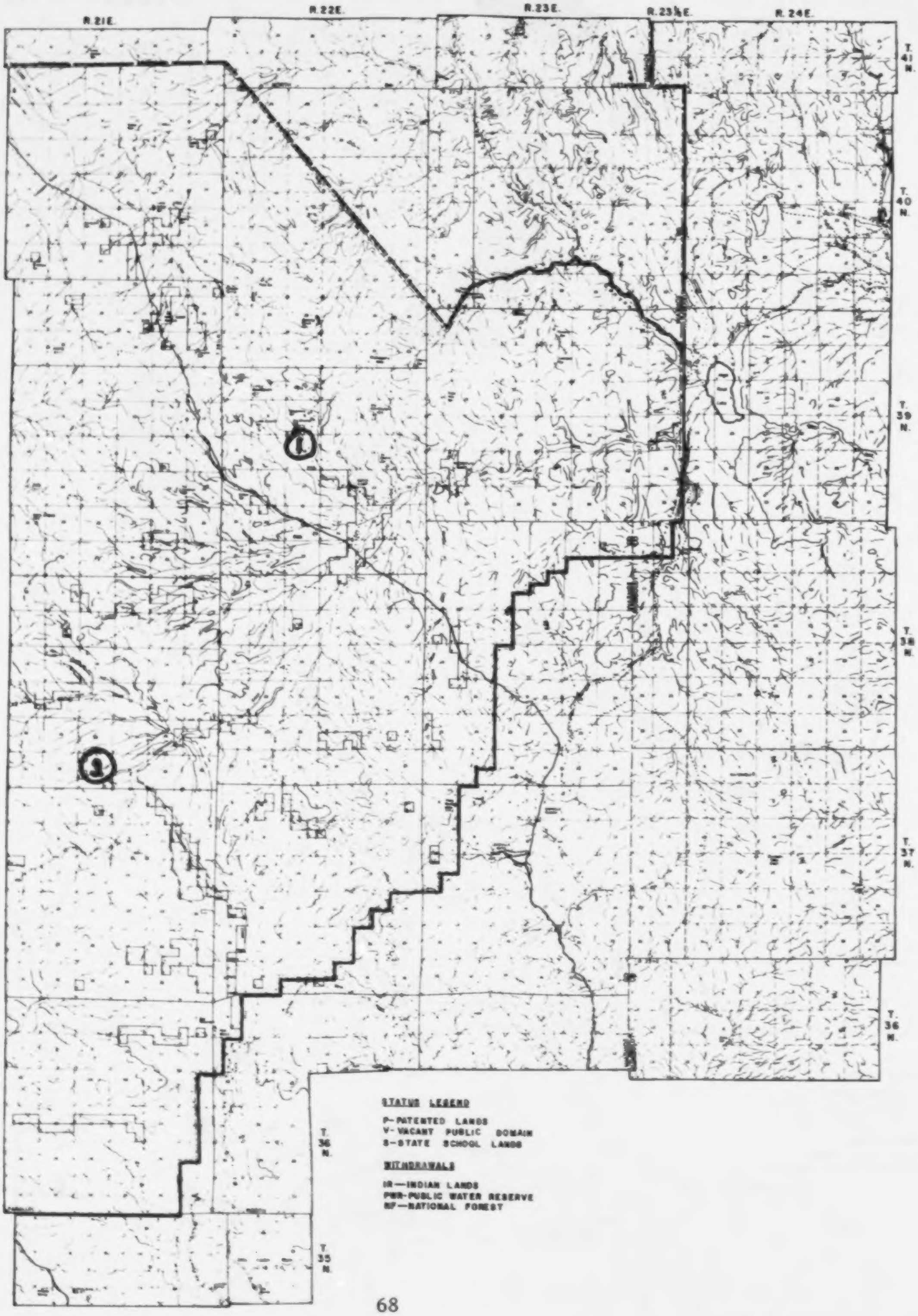
MEADOW

MAP 20

BUREAU OF LAND MANAGEMENT

CALIFORNIA

FEBRUARY 6, 1973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1
2
STATUS LEGEND
P-PATENTED LANDS
V-VACANT PUBLIC DOMAIN
S-STATE SCHOOL LANDS
WITHDRAWALS
IR—INDIAN LANDS
PWR-PUBLIC WATER RESERVE
NF—NATIONAL FOREST

MT. DIABLO MERIDIAN

1/4" = 1 MILE

08-09

HOME CAMP PLANNING UNIT SHEET 2 of 2

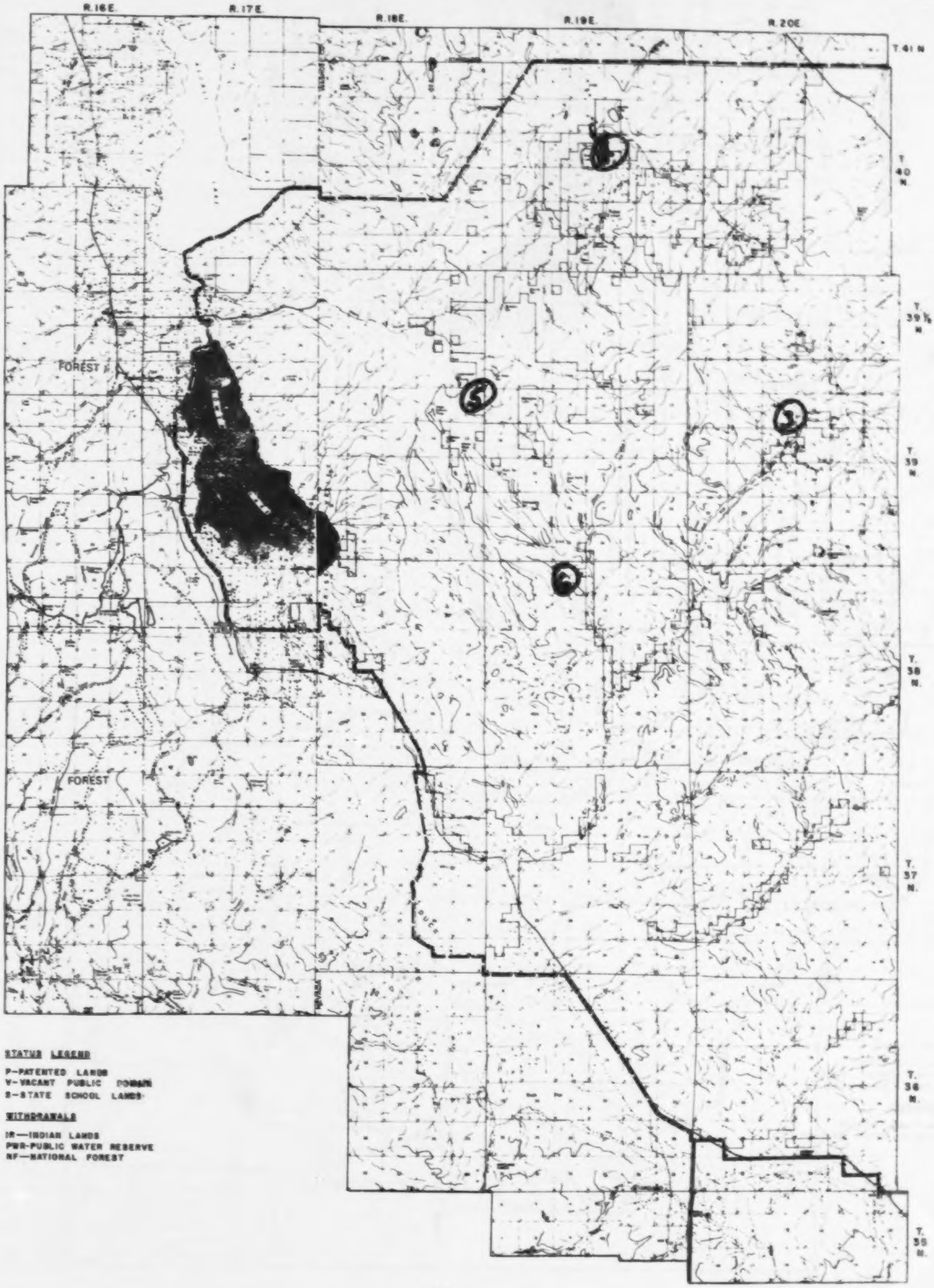
DRAWING NUMBER:04-020-09-5

MAP 21

MEADOW

BUREAU OF LAND MANAGEMENT CALIFORNIA

FEBRUARY 6, 1973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T. 39 N.
T. 38 N.
T. 37 N.
T. 36 N.
T. 35 N.
FOREST
FOREST
5
2
6

STATUS LEGEND

P—PATENTED LANDS
V—VACANT PUBLIC DOMAIN
S—STATE SCHOOL LANDS

WITHDRAWALS

IR—INDIAN LANDS
PWR—PUBLIC WATER RESERVE
NF—NATIONAL FOREST

MT. DIABLO MERIDIAN 1/4" = 1 MILE 02-09 HOME CAMP PLANNING UNIT SHEET 1 of 2

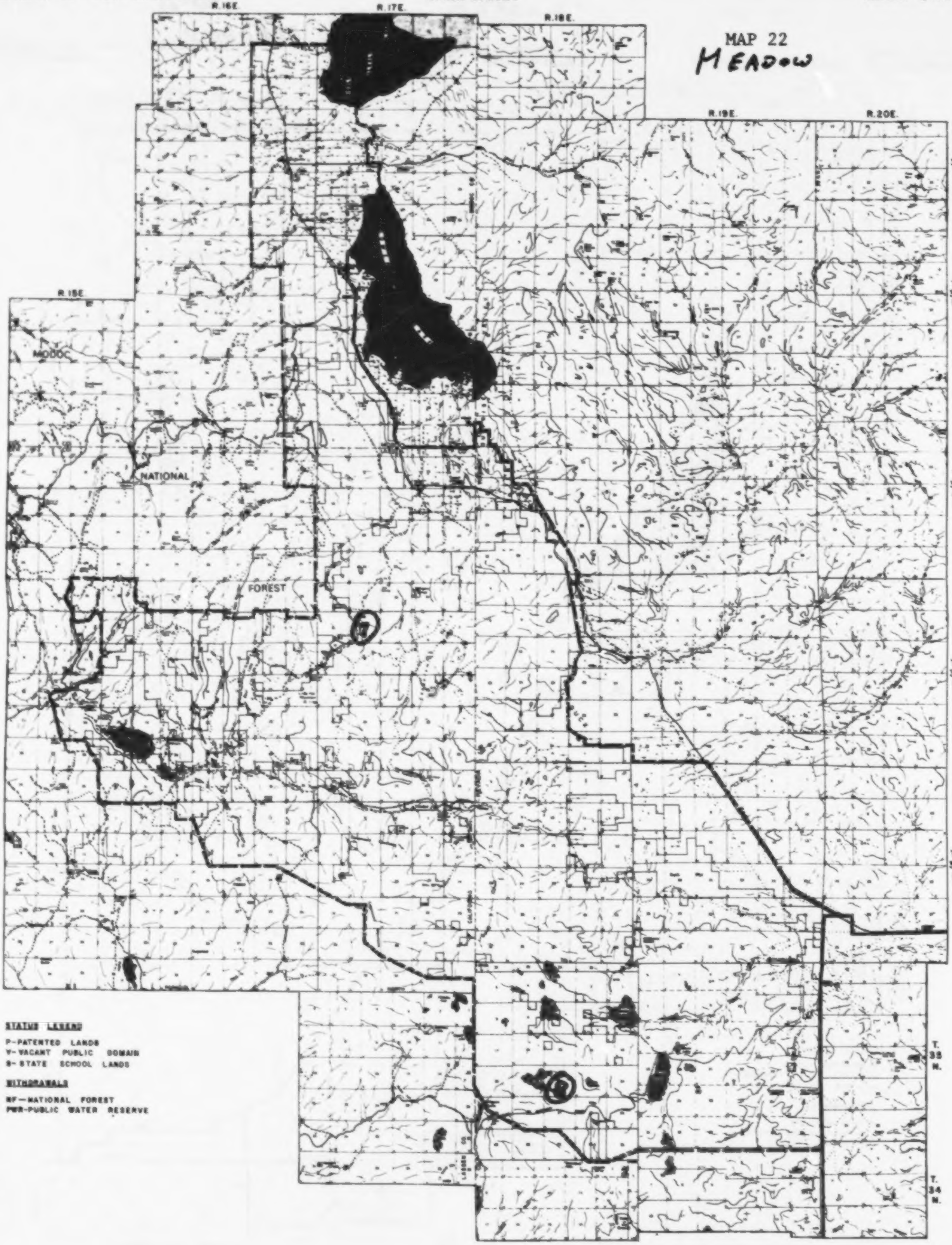
BUREAU OF LAND MANAGEMENT

CALIFORNIA

FEBRUARY 2, 1973

MAP 22

MEADOW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R.18E.
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T. 39½ N.
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T. 38 N
T. 37 N.
T. 36 N.
T. 35 N.
T. 34 N.
MODOC
NATIONAL
FOREST

STATUS LEGEND

P-PATENTED LANDS
V-VACANT PUBLIC DOMAIN
S-STATE SCHOOL LANDS

WITHDRAWALS

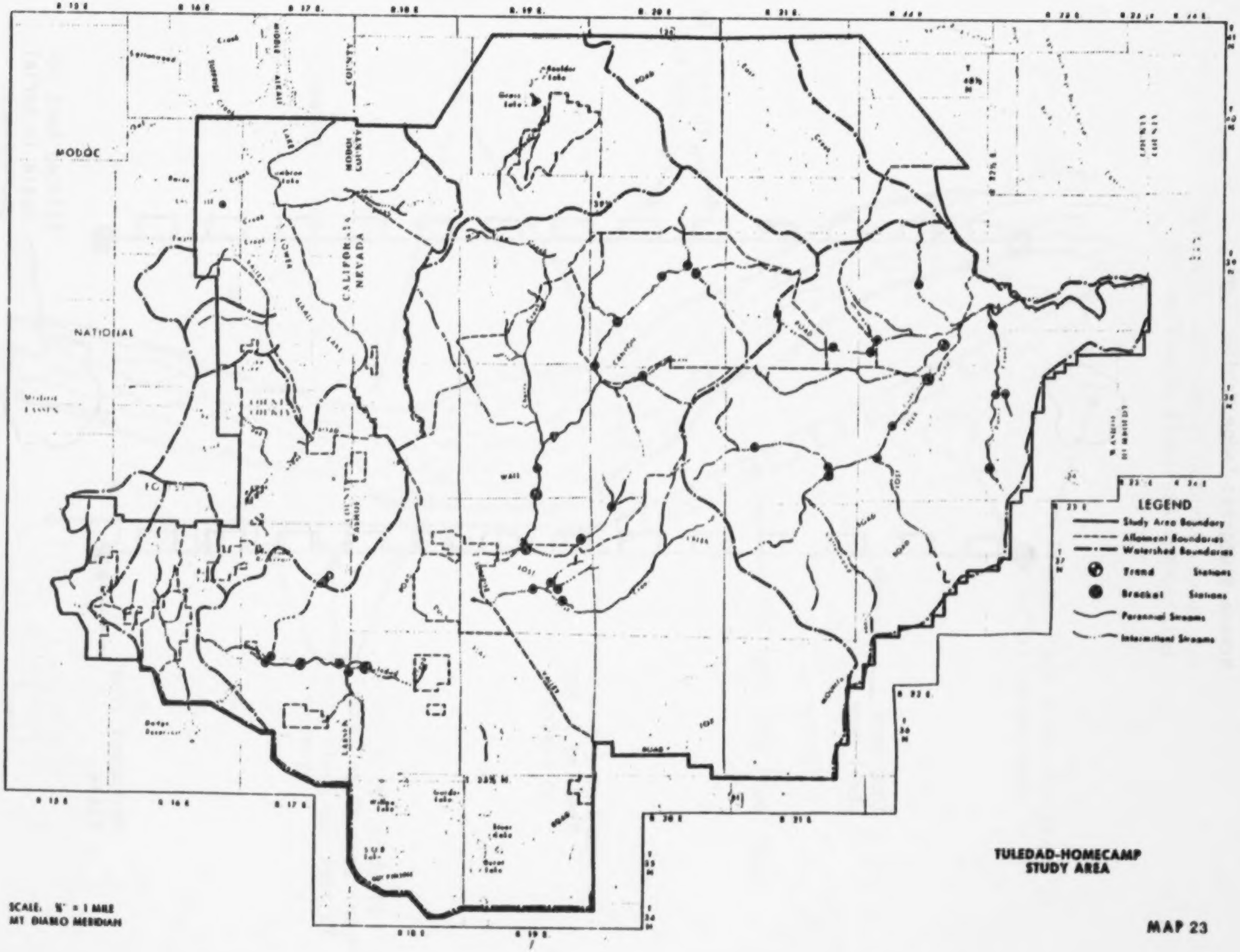
NF—NATIONAL FOREST
PWR-PUBLIC WATER RESERVE

DRAWING NUMBER:04-020-08-3

MT. DIABLO MERIDIAN

1/4"=1MILE

TULEDAD PLANNING UNIT


MODOC
NATIONAL
MIDDLE ALKALI
LOWER ALKALI LAKE
MODOC COUNTY
CALIFORNIA
NEVADA
WASHOE COUNTY
LASSEN COUNTY
Boulder Lake
Grass Lake
LEGEND
Study Area Boundary
Allotment Boundaries
Watershed Boundaries
Trend Stations
Bracket Stations
Perennial Streams
Intermittent Streams

TULEDAD-HOMECAMP
STUDY AREA

MAP 23

SCALE: ½" = 1 MILE
MT DIABLO MERIDIAN

FIGURE 4

Schematic Outline of Quadrat Layout For Nevada Bluegrass-Sedge Habitat Type

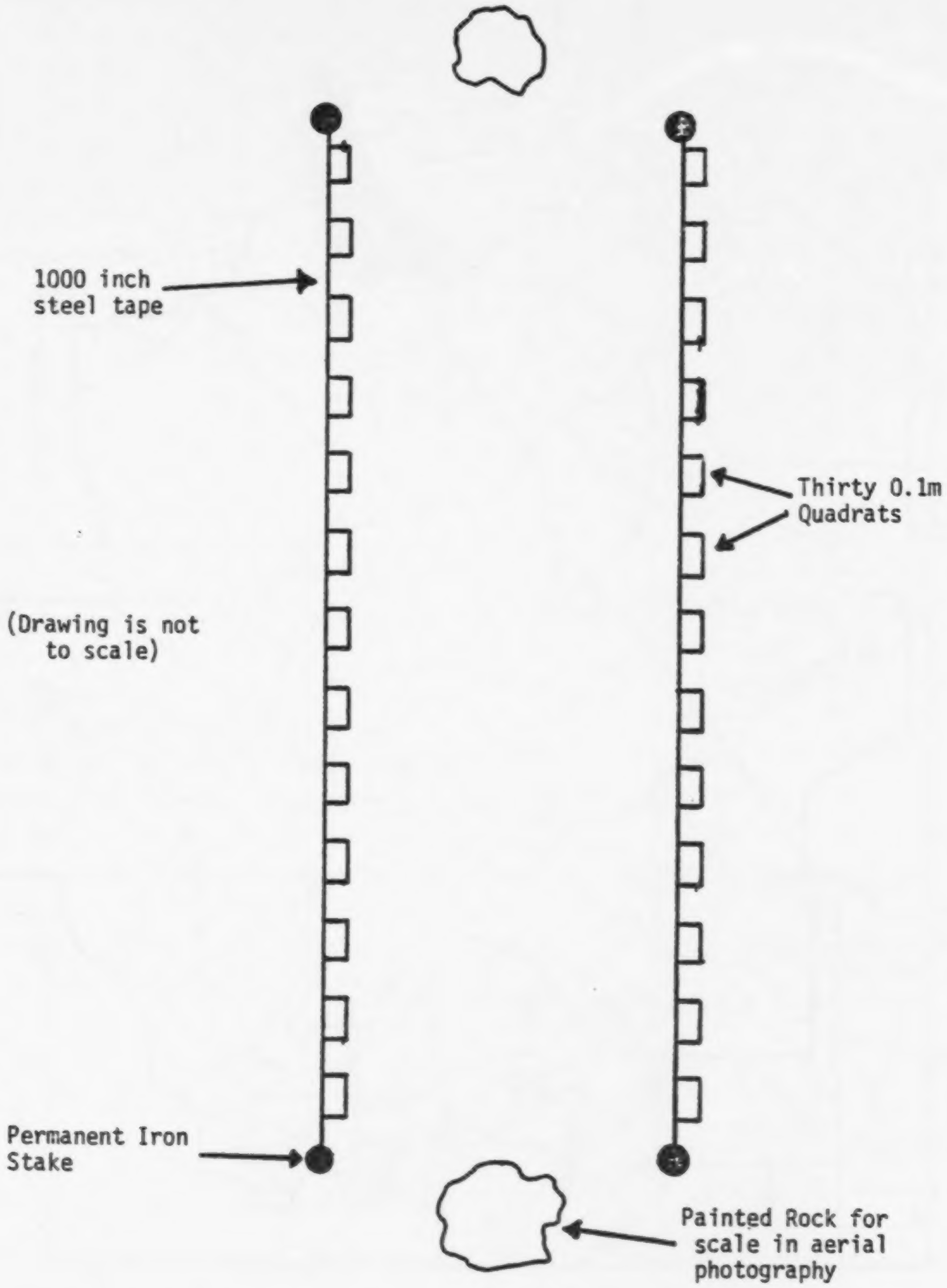

1000 inch steel tape
Thirty 0.1m Quadrats
(Drawing is not to scale)
Permanent Iron Stake
Painted Rock for scale in aerial photography

FIGURE 5

Schematic Outline of Quadrat Layout for
Willow/Nevada Bluegrass communities

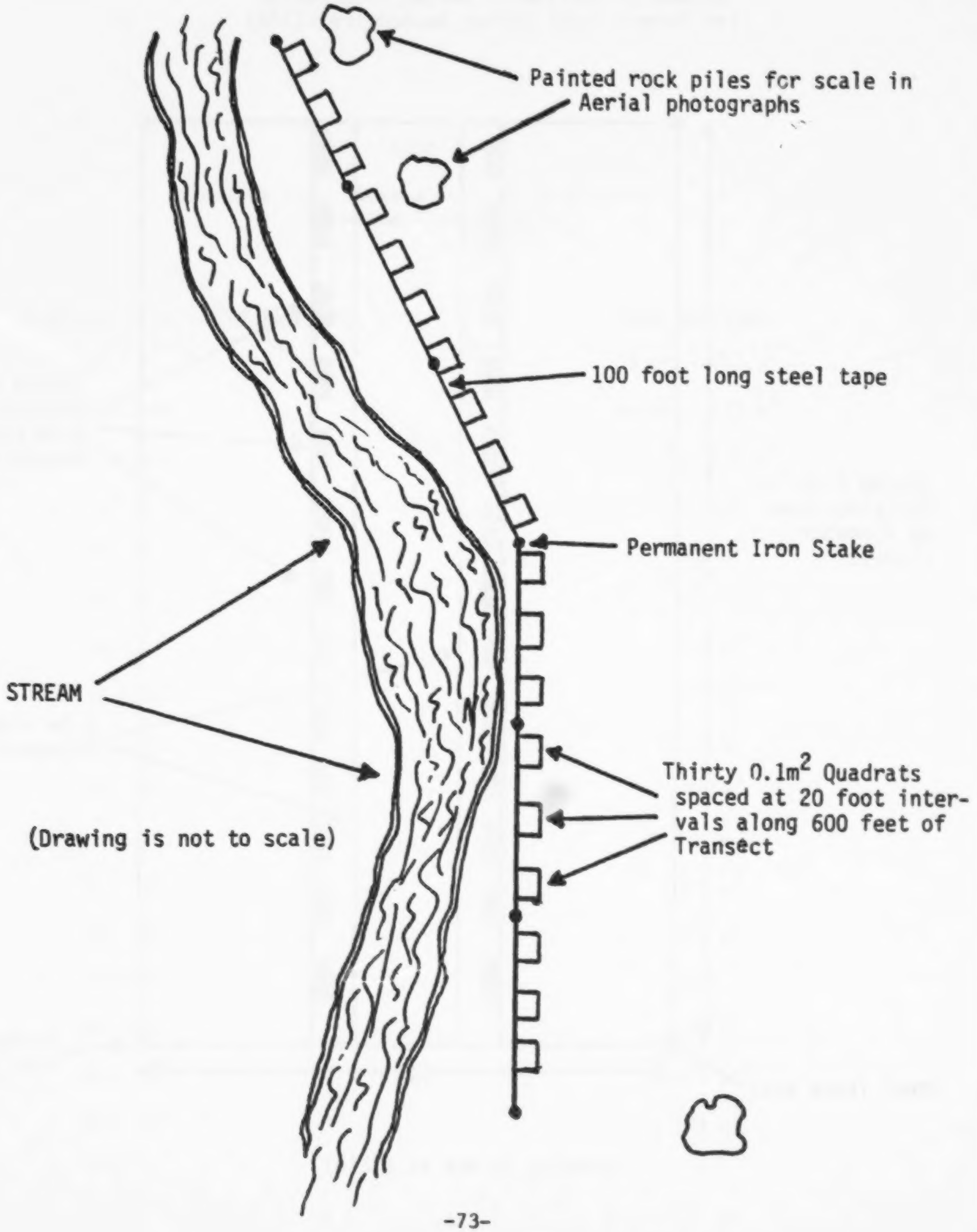
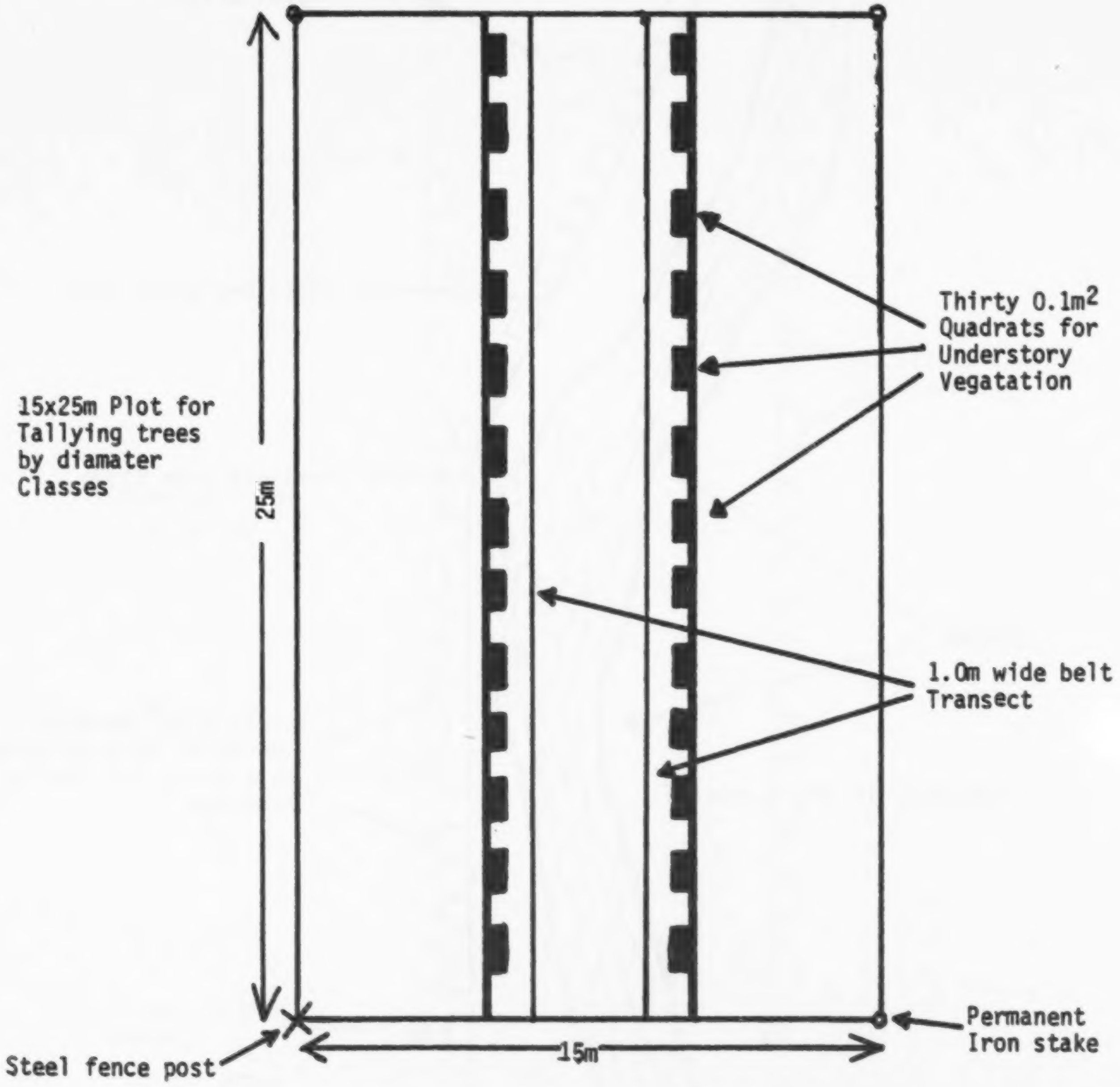

Painted rock piles for scale in Aerial photographs
100 foot long steel tape
Permanent Iron Stake
STREAM
Thirty 0.1m² Quadrats spaced at 20 foot intervals along 600 feet of Transect
(Drawing is not to scale)

FIGURE 6

Schematic Outline of Nested Plot Design
For Forest Types (After Daubenmire, 1968)


Thirty 0.1m^2
Quadrats for
Understory
Vegatation
15x25m Plot for
Tallying trees
by diamater
Classes
25m
1.0m wide belt
Transect
Permanent
Iron stake
Steel fence post
15m

(Drawing is not to scale)

TABLE 2

Diameter Size Classes for Tallying Trees In Nested Plot Design

Diameter Size Class (Inches)	Area Sampled
0 - 1	50 m^2 - 125 m^2
1 m Tall	50 m^2 - 125 m^2
1 m Tall	50 m^2 - 125 m^2
1 - 2	375 m^2
2 - 4	375 m^2
4 - 6	375 m^2
6 - 8	375 m^2
8 - 10	375 m^2
10 - 12	375 m^2
12 - 14	375 m^2
14 - 16	375 m^2
16 - 18	375 m^2
18 - 20	375 m^2
20 - 22	375 m^2
22 - 24	375 m^2
24 - 26	375 m^2
26 - 28	375 m^2

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Clark, P. J., and F. C. Evans 1954. "Distance to Nearest Neighbor as as Measure of Saptial Relationships in Populations." Ecology 45:445-453.

Cole, G. F. 1959. "Key Browse Survey Method." Western Association of Fish and Game Commissioners, Portland, Oregon.

Daubenmire, R. F. 1959. "A Canopy Coverage Method of Vegetational Analysis." Northwest Science, Vol. 33, p. 43-64.

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U. S. Department of the Interior. 1978. "Proposed Livestock Grazing Management for the Tuledad/Home Camp Planning Unit-Final Environmental Impact Statement." Bureau of Land Management, Susanville, California.

U. S. Interagency Advisory Committee on Water Data. 1977. "National Handbook of Recommended Methods for Water-Data Acquisition." U. S. Geological Survey, Office of Water Data Coordination.

COMMENTS

AX C. FLEISCHMANN COLLEGE OF AGRICULTURE

UNIVERSITY OF NEVADA RENO
DIVISION OF RENEWABLE NATURAL RESOURCES
920 VALLEY ROAD
RENO NEVADA 89512

RESIDENT INSTRUCTION
AGRICULTURAL EXPERIMENT STA
COOPERATIVE EXTENSION SERVIC

December 4, 1979

DEPT. OF INTERIOR
RECEIVED
DEC 10
BUREAU OF LAND
MANAGEMENT
CEDARVILLE, CALIFORNIA

Dept. of Interio
RECEIV
1979
BUREAU OF LAN
MANAGEMENT
SUSANVILLE, CALIFORN

C. Rex Cleary, District Manager
Bureau of Land Management
P. O. Box 1090
Susanville, CA 96130

Dear Rex:

Thanks for sending me a copy of the proposed Tuledad/Homecamp monitoring system for review. I am delighted to see so much attention given to monitoring. On the other hand, I am a little apprehensive that it's too much "pie-in-the-sky" — based on past records, I can't imagine BLM doing this much monitoring and, I'd happily settle for considerably less if that would assure that at least some responsible monitoring would actually be done.

Now to a few specifics:

Pages 1 & 2; Vegetation Utilization: You don't mention, as an objective, the identification of overused and underutilized areas. This should be one of the most valuable parts of the information for managers - securing proper distribution. To do this, however, you cannot just check utilization in a few key areas.

Page 3; Last sentence in next to last paragraph: "If stratification is proper, one key area in each stratum is adequate." I disagree - for determination of utilization - it's just not logical. An example: several stringer meadows in an allotment considered as one stratum; one meadow might be heavily used, another due to isolation or (?) might be virtually unused.

Also, I would not agree with the statement earlier in the paragraph: "Stratum smaller than 10 percent of the allotment will not normally be considered . . . " Ten percent of some allotments can be a lot of real estate and should not be ignored.

Page 5: Six objectives are given for condition/trend monitoring. None speaks to watershed except through the Universal Soil Loss Equation.

Page 7; Last paragraph, first sentence: "Each stand will be monitored . . . during the rest year." Are all your systems going to include rest (full year or more) for all land? I doubt this is necessary or justified. Also, the discussion in this paragraph goes a little beyond normal field technology limits (homoscedastic?????) But in the previous paragraph you simply state "frequency may also be determined from this data". More attention than this should be given to frequency. Are your people aware of:

> Tueller, et al. 1972. Methods for messuring vegetation changes on Nevada range lands. Nev. Ag. Expt. Sta. T16. (A BLM supported study)

Page 11; 3.b.(1): ". . . adjustments cannot be made unless the number and class of animals and the period of use are known . If this is true, how can BLM justify adjustments solely (or almost solely) on range survey data. If this is true, why is so much BLM effort devoted to determining "initial stocking rate" and/or "vegetative allocation" through production/proper use/etc. estimates when they could be basing on actual use and utilization?

That seems to be all the major notations I made while giving this a too quick review. Thank for the opportunity.

Sincerely,

Jack Artz

John L. Artz,
Range Scientist

P.S. Good to be home from D.C. Looking forward to getting back "in business" with you and others.

Comments to T/HC Monitoring System [illegible] Center
Mike Carter
Hopland Field Sta. U of Ca. Hopland, Ca.

Using a single plant of key species would be statistically better if you are looking at one species and not the range in general. From the definition of the different classes of utilization a single plant won't work if you want to determine utilization at each point along a transect (like the manual says). However, if you want to say each individual of a given species along a transect has a given utilization, then take a mean, a single plant is best. On the other hand looking at a single species (or 2 or 3) may be deceptive because livestock may shift from preferred species to the next most desireable species before the preferred is totally utilized. For example, they may start utilizing other species more heavily when the most preferred species reads 60-65% utilization, so range utilization may be heavier than indicated by looking at a single or small group of species.

One other point is that a single plant observation will reduce between observer variation (I would think) if two people look at one plant and say it is x% utilized they are more likely to be in agreement than if they look at a bunch of factors like current seed stalks, young plants, low-value plants etc. and try to integrate all of this into an estimate. Integrative methods work well with trained, experienced observers but, I don't know about less experienced people.

The single plant would be better but I think you should ~~at~~ add more species to get a better picture of what is going on. It would take more time but would give better results.

The six classes you have will probably give a more normal distribution of classes. The five classes in the manual make to big of jumps in the 0-20% range.

If your use height-weight relationships to minimize error due to height only why don't you just skip the height and estimate weight occularly with some double sampling to get a regression line for estimated vs actual weights and use the regression equation to correct estimations and use photos of known weight to help get your "eye in" at first. Why do you want height? Is there a particular reason for it?

UNITED STATES GOVE[illegible]MENT

Memorandum

DEPARTMENT OF THE [illegible]RIOR
BUREAU OF LAND MANAGEMENT
800 Truxtun Avenue, Room 311
Bakersfiled, California 93301

Dept. of Interior
RECEIVED
NOV [illegible]

IN REPLY REFER TO:
1792 (C-012.5)

BUREAU OF LAND
MANAGEMENT
SUSANVILLE, CALIFORNIA
NOV [illegible]

Date:

TO : District Manager, Susanville (C-020)

FROM : District Manager, Bakersfield (C-010)

SUBJECT : Review of Tuledad/Homecamp Monitoring System

Enclosed are the comments by each resource specialist for their discipline covered in the Tuledad/Homecamp Monitoring System. Our district hydrologist was not available for comment, but will forward comments to you at a later date if she has any.

Vegetation (C-012.5)

Pg.2,#a,(2) Wouldn't utilization studies be used to determine when use is approaching the level prescribed, which may not be moderate?

Pg.8 Good point made when you decided to use existing transects for baseline data. Also good explanation on stratafication and discussion on key species in preceeding section.

Pg.45 The proposed system and techniques used seem sound, but what if all this takes more time and money than that indicated on the Cost Analysis? It seems low. Did the estimates include total for orientation of crews, realistic field time, compilation and analysis of data collected? Were large scale aerial photos considered?

- General -

Looks like a good system, time and money permitting.

Wildlife (C-012.3)

1. Not adequate for game animals - why rely on F & G for info they normally don't have?

2. Why is there no effort to monitor reptiles and amphibs?

This monitoring document reflects the old prejudicies of not dealing with game and over-emphasing breeding birds and small mammal (rodents) non-game. Not an adequate wildlife monitoring system.

Soils (C-012.2)

Pg.15-17 Reference should be made to CA-USDA, SCS publication "Guides for Erosion and Sediment Control" (1975) for guidance in use of Universal Soil Loss Equation in California.

No mention of wind erosion (is it a problem?). There is an equation for monitoring wind erosion also!

Question - Who will be conducting or evaluating the transects? Need to know who, what, where, and when - not enough detail.

Water resources looks detailed enough.

Cultural Resources (C-012.7)

1. Looks O.K., however, they have allowed only 1 WM every year from 1980 - 1984 - this would not allow additional inventory and monitoring of NR sites as required on page 15 (see page 45).

The general tone on pg.15 is quite general - I'd like to see specifics, but they may not be required in this report.

Thanks for the chance to comment.

Louis R. Ball

[illegible]

COOPERATIVE EXTENSION
UNIVERSITY OF CALIFORNIA

ORNIA 95616

REPLY TO: Agronomy & Range Science Extension
127 Hunt Hall

November 30, 1979

DEPT. OF INTERIOR
RECEIVED
DEC 7 1979
BUREAU OF LAND MANAGEMENT
CEDARVILLE, CALIFORNIA

Dept. of Interior
RECEIVED
DEC 3 1979
BUREAU OF LAND MANAGEMENT
[illegible]

Mr. C. Rex Cleary
District Manager
Bureau of Land Management
P.O. Box 1090
Susanville, CA 96130

Dear Rex:

These comments are in response to your "monitoring system" for the Tuledad/Home Camp environmental statement area. Since John Menke responded with comments to the vegetation monitoring schemes, I would like to mention two other areas of monitoring importance. The first of these is with respect to game birds and animals. It is unclear as to where the specific monitoring procedures for these animals fit into the description. They are not included under components to be monitored but are referred to when describing vegetative habitats. I think it important to gather the animal data along with the vegetation information so that the present use decisions can be more accurately validated and help with future adjustments if needed. Possibly you will be relying on the respective states Fish and Game staff to handle this part of the information gathering. If so, it could easily be mentioned and the procedures they will follow be described in your document. I am sure this will help maintain the continuity of monitoring in the years to come.

Dr. Bill Longhurst indicated that much of the deer population in the sagebrush are resident and sampling to obtain an indication of the adult to young ratio could be done prior to the arrival of the migrating deer. Bill thought that this measurement in itself is a good indication of the condition and number of animals. Undoubtedly there are more and similar things could be done with the game birds.

Another area of monitoring that would add to the management information base would be that relating to the domestic livestock grazing in the area. This would go beyond numbers and forage utilization and try to get some indication of the animal productivity on your land. This type of monitoring would probably be best done on a sampling basis and have to relate to the entire ranching operation of a permitee. This is a little more difficult to handle because the production performance of a herd relates to the year-round feed supply and not just that obtained during the time on the public land. However, that segment of the production monitored along with that from the other lands would be very helpful both to the ranchers and to BLM staff. I know that Cecil Pierce, Carl Rimbey and other Extension people would be most anxious to cooperate with this phase of a monitoring program. For the purposes of your document, that

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University of California and the United States Department of Agriculture cooperating.

monitoring that would be done on the BLM land could be described as one component of getting a better measure of the total livestock production management for selected herds.

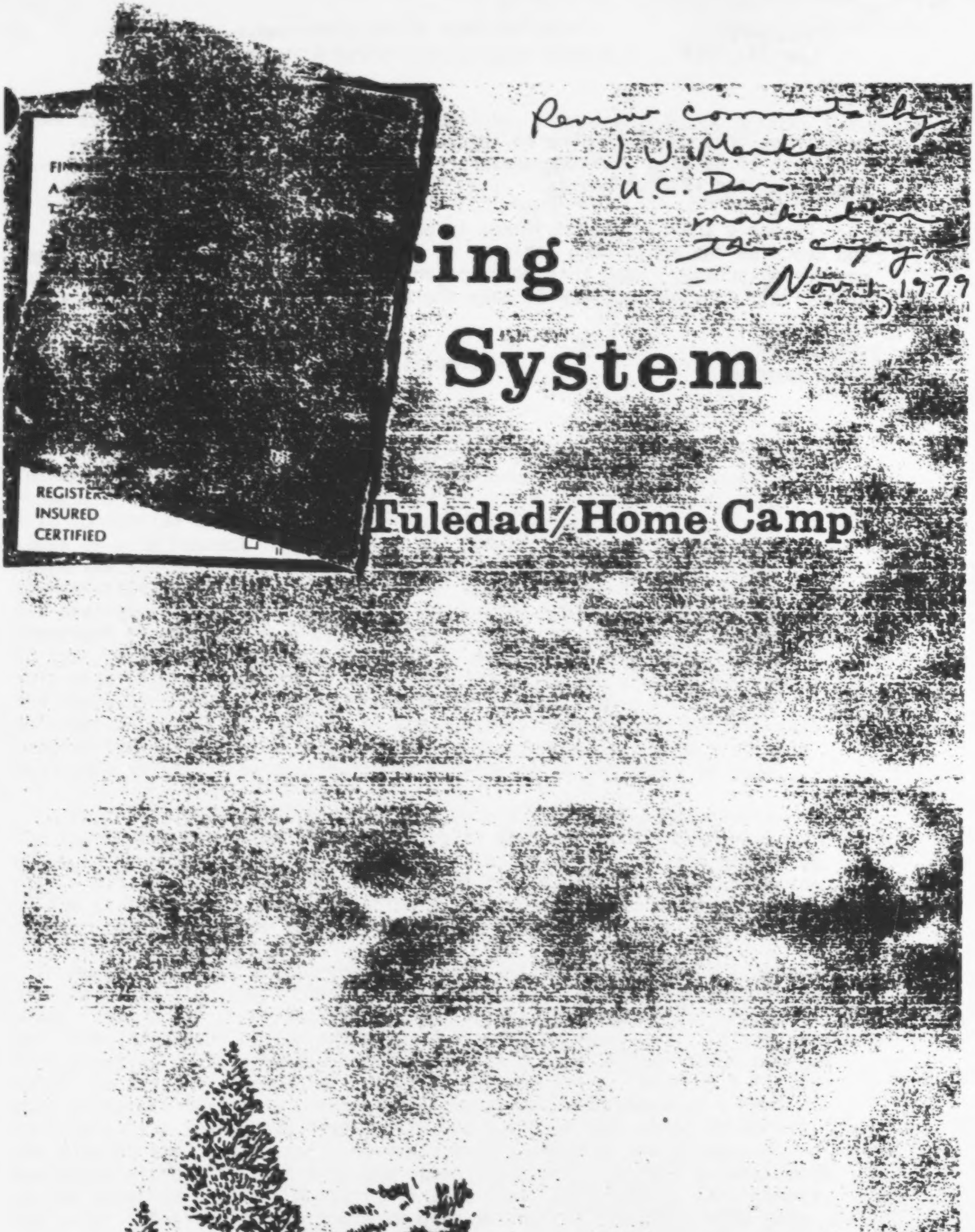
Probably the biggest challenge in both of these comments is to try and describe the monitoring activity on the BLM land as one part of a larger monitoring scheme. Both this description and who could logically and effectively do what chores will take the most thought and discussion.

Cordially,

W. James Clawson

W. James Clawson
Extension Range Specialist

WJC:js



FIN

A

T

[redacted]

REGISTER

INSURED

CERTIFIED

ring System

Tuledad/Home Camp

Review comments by
J. U. Menke
U.C. Davis
marked on
this copy
Nov 1, 1979

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
District Office

levels causing a need for

(2) To determine in advance when use is approaching moderate ~~and direct~~ movement of livestock to another pasture. unclear

(3) To determine degree of use made by livestock during the grazing season and degree of use made by wildlife before grazing season begins (throughout winter).

unclear why this is done see ( )

(4) Determine degree we are increasing the carrying capacity of deer and antelope range to handle animal objective numbers. awkward

b. Methodology

(1) Grasses and Forbs: KEY FORAGE PLANT METHOD will be ~~utilized~~ used and is an ocular estimate method of judging utilization within one of five utilization classes on one or more key species and on the area as a whole. This method is adapted to areas where perennial grasses are the key species and utilization data must be obtained over large areas with few personnel. This method is rapid and does not require unused areas for training purposes. Estimates are based on a descriptive term representing a broad range of utilization rather than a precise amount. Different examiners are more likely to estimate similar utilization classes than exact utilization percentages.

? do yo mean compari

uncle

agree strongly

Daubenmire has shown this clearly. I have also recently found this to be true on low sagebrush and pine-juniper-shrub communities in Modoc County.

Utilization transects will be run utilizing BLM Manual 4412.22B for guidance as summarized below:

transe are with SWA's S lope. There a stro need f this k of veg strat tion

The starting point is tied to a known reference marker and the direction of the course set by compass or a clearly defined natural feature.

Establish straight line transects, across drainages if possible, in order to obtain a cross section of environmental differences in the key area.

Document the location, starting point, and direction so that future utilization studies may be conducted in the same general area.

Locate observations (an observation point is the immediate area, containing the key species, the examiner can see around him when standing at a particular location along the transect) at constant intervals along the transect by pacing or using the speedometer of a vehicle to determine distance between plots. The toe of the boot or, if using a vehicle, some point on the body of the vehicle is used to determine locations. Plot or observation interval along the transect must be documented. Permanent location with stakes or other markers is not necessary.

Key species must be present; if not present at the proper interval, move to enclose the nearest plant of these species. DO NOT BE SELECTIVE. The next interval along the transect is measured from this latter point.

Utilization studies will be made at any time during the grazing period to move livestock and/or adjust stocking.

be used as criteria to

Stratification is a means of dividing a sample into smaller, more homogeneous units to simplify measurement. Thus, an allotment or pasture is divided into areas having similar characteristics. Strata may be areas having similar vegetation, compariable soils, uniform topography, etc. In areas of broad, generally flat or rolling plains with uniform vegetation, climate, and soil, the entire allotment may be one stratum requiring only one key area. Stratum smaller than 10 percent of the allotment will not normally be considered separately, unless it constitutes a highly productive area (meadow) or a crucial area. Each major habitat type may be a stratum or, according to need, the type can be further stratified using other considerations. Range readiness is an important stratification consideration as stratification may be based on seasonal use areas such as spring range, summer range, etc. Each crucial area (i.e., meadows, strutting grounds, etc.) identified in the allotment should be considered as a separate stratum. Key areas are portions of a stratum which, because of location and grazing use, serve as indicative samples of conditions within the stratum. Key areas may be considered as the "pulse" of the range. If stratification is proper, one key area in each stratum is adequate.

Not really simplify! The purpose of stratification is to reduce variance of estimates and increase accuracy. Areas of each stratum must be known to determine average conditions

do you mean critical need define

Utilization data will be recorded on Form 4412-12. Data will be filed in the AMP file.

U1

or comment:

ased upon
terature of Daubenmire
d work of my own
Great Basin types,
strongly recommend
at the utilization
asses be changed.
would suggest 6 classes

0-5 5 % units
5-25 20 "
25-50 25 "
50-75 25 "
75-95 20 "
95-100 5 "

It is very easy to
judge very low or
high use and
the use of 0-20
r slight use gives a
lass midpoint of 10%
ue which severely
ffects mean use estimates.
Same for the 81-100 class.
This factor alone
biases use estimates
upward. The six classes
ion above are
easier to judge than
your 5 classes.
The two 0-5 classes
are easiest, the two
25% unit classes are
easier than your
20% unit classes,
and my two 20%
unit classes are
the same difficulty
to estimate as
all yours.
i.e. Overall
my 6 are better. Even more important,
they have been shown
to be more sound statistical
measures

Utilization classes are used to show **five relative** degrees of use. The descriptive term **represents a** numerical range of percent utilization. **Estimate utilization** within one of the five classes. Utilization **classes** are described as follows:

% units

Slight (0-20%): Range shows no evidence of use by livestock or range has the appearance of very light grazing. The key forage plants may be topped or slightly used. Current seedstalks and young plants of key species are little disturbed. 20

Light (21-40%): Range may be topped, skimmed, or grazed in patches, low value plants ungrazed; 60 to 80 percent of the number of current seedstalks of key plants remain intact. Most young plants are undamaged. 20

Moderate (41-60%): Range appears entirely covered as uniformly as natural features and facilities will allow. Fifteen to 25 percent of the number of current seedstalks of key species remain intact. No more than 10 percent of the number of low value forage plants utilized. (Moderate use does not imply proper use.) 20

Heavy (61-80%): Range has appearance of complete search for forage by livestock. Key species almost completely utilized with less than 10 percent of the current seedstalks remaining. Preferred shrub hedged, shrub clumps may be slightly broken, shoots of rhizomatous grasses missing. More than 10 percent of the number of low value forage plants utilized. 20

Severe (81-100%): Range has mown appearance. Indications of repeated coverage. No evidence of reproduction or current seedstalks of key species. Key forage species completely utilized. Remaining stubble of preferred grasses grazed to soil surface. Shrub clumps hedged or broken. 20

(2) Bitterbrush and Mountain Mahogany: The modified Cole Browse transect method will be utilized to measure total utilization of important browse species.

Utilization will be evaluated for 50 plants on each of six transects using the modified Cole Method (FIGURE 1). Starting points for utilization transects will be the same as for the condition and trend transects. The transects will be run from the starting point to the closest bitterbrush plant? within a 180 degree selection zone. From each successive closest plant, one pace is

Only bitterbr. ??

Key species will be selected which will allow successional trends to be determined. Bitterbrush, aspen, bluebunch wheatgrass, Thurber's needlegrass, Idaho fescue, Sandberg bluegrass, and squirreltail will be monitored on selected areas. Cross-sectional sampling may represent various combinations of such key species or others depending upon the frequency and density of such species and their relative value to the key area.

why not mature also

Three to five 100-foot lines (the number of lines varying with the heterogenity of the vegetation) will be used for shrub canopy cover (FIGURE 2). The intercepted length of the live portion of the canopy of each shrub will be recorded. Age and form classes (U. S. Dept. Int., BLM, 1969b) of all intercepted shrubs will also be determined. The number of individuals of each shrub species rooted within one-half meter of each side of each 100-foot line will be recorded.

Shrub canopy cover and density (the number of individuals per unit area) will be measured by the line intercept method (Canfield, 1941) and belt transects, respectively.

Canopy cover of all herbaceous species, litter and basal cover (basal area expressed as a percentage of ground area) of all bunchgrasses will be estimated in thirty 0.1m2 (50 cm x 20 cm) quadrats located at five-foot intervals along two of the 100-foot lines (FIGURE 2). A series of unequal classes will be used for the coverage estimates: 0-5, 5-25, 25-50, 50-75, 75-95, and 95-100%. Such classes leave little chance for personal error in class assignment, yet are adequate to bring out subtle differences when results from a considerable number of small plots are averaged (Daubenmire, 1959). Frequency may also be determined from this data.

same as proposed for utilization - same reasons apply as stated here

Each stand will be monitored at six-year intervals during the "rest" year. Observed differences in canopy coverage and density can be tested for statistical significance in a randomized block analysis of variance design with stands as blocks and time as treatments. If the data are not normally distributed and homoscedastic, they must be transformed (the arc sine transformation is often used with coverage data) or analysed by nonparametric statistical designs such as chi-square as blocks and time as treatments. The data will probably require transformation for parametric tests. Nonparametric tests can be used without data transformation.

Why no ment
of big game
monitoring?

B. Wildlife

1. Fisheries

a. Objectives

See Vegetative Condition and Trend.

b. Methodology

Physical, chemical and biological properties will be monitored at four stations along Bare Creek (Tuledad), and one station on Silver Creek (Tuledad), Selic Creek (Selic-Alaska) and Wall Canyon Creek. Physical and chemical characteristics will be sampled annually at all seven stations. Data collected will include: stream width, stream depth, stream flow, condition of benthos (amount of usable gravel in stream bed), bank erosion, streamside cover, and stream shading. Stream flow, conductivity, temperature, dissolved oxygen, suspended sediment, coliform bacteria, phosphorous and plankton will be monitored under the water resources program and used in evaluation of fisheries habitat condition.

Biological data will be gathered once every four years in cooperation with California Department of Fish and Game. Macro invertebrates will be sampled (four samples per station) with a surber sampler. In addition, physical barriers to fish movement, pollution sites and any other unstable features will be recorded. Electroshocking of fish will also be conducted at this time.

This aquatic monitoring system deviates from the one proposed in the ES (Appendix D) by dropping the monitoring on gradient, turbidity and pH. The above mentioned stream characteristics will not be used as a basis for management change and therefore, are not needed in the monitoring system. It is felt vegetation management will do little to change the gradient of streams (i. e., raise stream bed to original level) but that special structures would be required. Turbidity and pH will be included in the water resources monitoring.

Two sample sites in addition to those proposed in the ES were added to the sampling system. They are Selic Creek and Wall Canyon Creek and are necessary to reflect the impact of the AMPs on the streams contained in these allotments.

Nevada Department Of Fish And Game

GLEN K. GRIFFITH
DIRECTOR

ROBERT LIST
GOVERNOR

1100 VALLEY ROAD • P.O. BOX 10678 • RENO, NEVADA 89520 • TELEPHONE (702) 784-621

RECEIVED
NOV 7 1979
BUREAU OF LAND
MANAGEMENT
SUSANVILLE, CALIFORNIA

November 6, 1979

Mr. Rex Cleary
District Manager
Bureau of Land Management
P. O. Box 1090
Susanville, CA 96130

Dear Rex:

The Nevada Department of Wildlife appreciates the opportunity to review and provide comments to your Tuledad/Home Camp Monitoring System document.

Monitoring methodology as presented in this document appears adequate to detect changes to wildlife habitat from the management system implemented.

It is recognized that the key to success of the management system is dependent upon the follow-up and consistency of which the monitoring system is applied.

If the monitoring system is applied as described in this document, then the management system can be altered as needed to meet the stated objectives.

Sincerely,

GLEN K. GRIFFITH, DIRECTOR

Glen C. Christensen
Chief, Game Division

GCC:gjf

Monitoring System File

Dept. of Interior
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DEC 6 1979
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SUSANVILLE, CALIFORNIA

1792 (932)

DEPT. OF INTERIOR
NOV : RECEIVED
DEC 7 1979
BUREAU OF LAND MANAGEMENT
CEDARVILLE, CALIFORNIA

Memorandum

To: State Director, California

From: State Director, Oregon

Subject: Tuledad/Home Camp Monitoring System Developed by the Susanville District.

The district should be commended for documenting a plan for monitoring the Tuledad/Home Camp EIS implementation procedures. I am hopeful that the comments from my staff will be helpful in your monitoring efforts.

General

There is a general feeling that monitoring systems be examined for a broader base and not consist of numerous individual systems that appear to be disjointed. The systems should utilize official BLM methods. Time and costs seem to be underestimated and the sample intensity may be too light to provide meaningful results.

Watershed and Fisheries

Many of the processes proposed are not documented, official procedures. They may have questionable value if we should have an appeal or court action.

The objectives for water monitoring are commendable and the stratification for sampling seems reasonable but, due to natural variability, the sampling frequency is too light.

The water monitoring system is loosely defined and appears generally inadequate to meet any needs to identify change in water quality resulting from management activities. The scope of the effort may be too narrow and the cost estimates appear quite conservative. Assessment of impacts to channel morphology has not been addressed.

In evaluating fisheries habitat factors to look at, the needs of the fish [illegible] not adequately considered. In arid areas, the two most limiting factors are the needs for reproduction and the winter or summer extremes. [illegible] should be established to monitor these conditions.

Some of the factors that might be considered are: availability of spawning areas; pool area, including area depth and quality; percentage of firm substrate needed for food production; bank stability; streamside cover, including percent of potential diversity, canopy and shade. For fuller explanation, see the Interagency publication on "Managing Riparian Habitats in Eastern Oregon and Washington."

The macroinvertebrate samples are best taken in conjunction with the water quality samples. It wasn't mentioned, but we presume the samples will be analyzed for biomass, species diversity index, and species composition.

Flows should be taken continuously at the index or base stations. Water quality samples should reflect seasonal changes. If only one sample is to be taken a year, take it in different seasons. Heavy metals are not addressed yet are often a major problem in arid areas. A small point, it was unclear from the coliform discussion whether total and fecal or total and fecal strep would be measured.

Fish sampling should be done in more than one season. Because of fish migrations, and the use of non-permanent areas for spawning and rearing, special care must be taken with sampling to locate spawning and rearing areas. This cannot generally be done by sampling in late summer which is outside the reproductive period of most arid area fishes.

There is a question as to the need to do plankton or seston sampling since they are not a separate developed component of the stream biota but are constituted essentially of drift. Periphyton might be included at intervals but would not need to be measured on a regular basis. Actually, a good macroinvertebrate sampling program will provide the same information as the four together and would serve adequately for any monitoring effort.

There is a feeling from reading through the document that the monitoring elements were developed separately rather than as part of an overall plan. The monitoring plan would be better served if it were integrated so that the various aspects worked together to monitor the ecosystem as a system.

Range

Range studies required to evaluate grazing systems are fairly well established and manualized. Therefore, it may serve little purpose to further document the studies as was done for the Tuledad/Home Camp area. However, the studies for other resources as appropriate, should be definitely determined and the procedures documented. The Tuledad report would be important for this purpose.

Thank you for sending us a copy of the report. We will use appropriate portions of the procedures in monitoring the Drewsey EIS area.

cc: Susanville, California District

best copy available

STATE OF CALIFORNIA—THE RESOURCES AGENCY EDMUND G. BROWN 'R., G

DEPARTMENT OF PARKS D RECREATION
P.O. BOX 2390
RAMENTO 95811
) 322-8588

Dept. of Interior
RECEIVED
NOV 19 1979
BUREAU OF LAND
MANAGEMENT
SUSANVILLE, CALIFORNIA

November 16, 1979

Mr. C. Rex Cleary, District Manager
Bureau of Land Management
District Office
P.O. Box 1090
Susanville, CA 96130

Dear Mr. Cleary:

Thank you for sending this office a copy of your "Monitoring System: Tuledad/Home Camp". I have reviewed it and find that, as usual, your staff has done a good job. I noted that the section on cultural resources is brief but adequate for the job intended if the objective is adhered to.

Again, thanks for the opportunity to see the report.

Sincerely yours,

Francis A. Riddell

Francis A. Riddell, Supervisor
Cultural Heritage Section

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BUREAU OF LAND
MANAGEMENT
CEDARVILLE, CALIFORNIA

STATE OF CALIFORNIA—RESOURCES AGEN

EDMUND G. BROWN JR., Gov

DEPARTMENT OF FISH AND GAME

Box 1480
ing, CA 96001
(916) 246-6511

Dept. of Interior
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NOV 13 1979
BUREAU OF LAND
MANAGEMENT
SUSANVILLE, CALIFORNIA

1792

November 8, 1979

Mr. C. Rex Cleary, District Manager
U.S. Bureau of Land Management
P.O. Box 1090
Susanville, CA 96130

Dear Rex:

Your proposed Tuledad/Homecamp Monitoring System 1792 (C-020) T/HC has been reviewed. The system is well designed and will provide the information necessary for management of allotments as prescribed in your environmental statement. We have no recommendations to offer for changes in this monitoring system.

1 We are concerned regarding one aspect mentioned under VI, item b, page 40. This item, construct additional livestock water sources, should be carefully considered. Our concern is that development of additional water may spread livestock to, and increase grazing use of, key wildlife habitats to the detriment of these habitats.

Thank you for the opportunity to review and comment on this program. The system appears to be an excellent one and except for our one concern, is acceptable to us.

Sincerely,

Spike

A.E. Naylor
Regional Manager
Region 1

UNITED STATES GOVERNMENT
Memorandum

DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Folsom District Office
63 Natoma Street
Folsom, CA 95630

IN REPLY REFER TO:
C-042.9
4000

TO : District Manager, Susanville

Date: DEC 7 1979

FROM : District Manager, Folsom

SUBJECT : Folsom District Comments on the Tuledad/Home Camp E.S. Monitoring System

Please accept our apologies for being late with these comments. We had all pertinent specialists and all of our range conservationists examine the system. Thus it was quite difficult to get the single copy of the monitoring system around.

Overall, we are quite impressed with the system. It is quite comprehensive and should give you a large amount of reliable data. Herein lies the largest problem: it may be too time consuming and expensive. So often BLM studies are initiated with good intentions but higher priorities for time, money or both get in the way.

Specifically, our comments are.:

Page 2, para 6. We cannot find the word "compassor" in our dictionary. The sentence does not make sense.

Page 2-3, para 9, 1. We oppose the use of BLM vehicles off the road. This only invites more ORV use. The only place vehicles could be used is along an established road. But - this is an unnatural situation. One possible way that a vehicle speedometer could be used would be to stop at a given point on the odometer, leave the vehicle and go a sufficient distance from the road (i.e.), and then do the observation.

Page 7, para 3. Canfield Transects, one of the older range study methods, is still one of the best. They are fast, simple, and relatively accurate.

Page 7, para 4. Our people have made extensive use of the Daubenmire Cover Class method. It has proven highly successful.

Page 14, 2b. Methodology:

Para 1, last sentence. What do you plan to do when specific information is not available? The Fish & Game has basic data on bird harvest, but little or nothing on breeding success, mortality, vectors, age composition, or viable population parameters.

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MANAGEMENT
SUSANVILLE, CA [illegible]

SC-1541-2

Para 2. Why are you limiting nongame monitoring to four critical deer habitat areas? Don't you feel that the other habitat types (juniper, big sage, low sage, etc.) deserve species monitoring? Do you plan to monitor these types year long?

Para 3. The Folsom District has found that we only trap certain species of the total species present by using snap or live traps. Williams, California State College, Stanislaus indicates pitfall traps collect a representative sample of all species using a habitat site.

Para 4. Will an attempt be made to separately census raptors, correlate small mammal census with raptor populations, and the effects of grazing on prey populations?

Alan P. Thomson

UNITED STATES DEPARTMENT OF AGRICULTURE
SCIENCE AND EDUCATION ADMINISTRATION

AGRICULTURAL RESEARCH
WESTERN REGION
RENEWABLE RESOURCE CENTER
USDA/SEA
920 Valley Road
Reno, Nevada 89512

Dept. of Interior
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NOV 1 1979
BUREAU OF LAND MANAGEMENT
SUSANVILLE, CALIFORNIA

October 31, 1979

Rex Cleary
District Manager
USDI/BLM
P. O. Box 1090
Susanville, California 96130

Dear Rex:

I have read your proposed monitoring system and found it very complete. I assume that you will be getting comments from all resource specialists, so I will confine mine to the vegetation monitoring.

1 > has been changed

1. P. 2. Objective 2 of vegetation utilization. This statement appears to be incorrect since the Draft ES states that livestock will move from the early use pasture to the next pasture in sequence based on seedripe not utilization in the former. Perhaps this statement should be used to inject the idea that when use approaches moderate before time to move, some means are needed to reduce livestock numbers on the key areas in question.

sounds good

2. P. 31. The Summary indicates that utilization on most areas will be determined twice while livestock are in a pasture, once after they are removed. The idea to read twice is excellent, and I suggest that the two readings be made during the critical spring growth period of key species. My experience on two allotments has shown that concentrating all livestock in one-third of the allotment results in heavier use of key species on key areas during the spring than does season-long use. If this happens, these species may not respond as hoped because the rest period is not long enough to compensate for heavy continual use during the critical growth period.

3. P. 6b Methodology. My comments on this section are divided into four parts.

    a. What use will be made of canopy cover of herbaceous species? This measurement can be used to characterize a habitat type, since it does estimate dominance, but is not a trend method and I doubt that Daubenmire meant for it to be used for this purpose. The Daubenmire reference indicates its use for vegetation analysis is relating stand characteristics to soil characteristics. Use of canopy coverage is like using production to measure trend. There is just too much annual variation in both with respect to total and species response to be able to separate condition differences from weather induced differences.

true

b. Frequency is a very objective and sensitive method for trend measurement. I suggest you check on the publication by Hyder et al. and Tueller et al. for use of this method. Frequency should be obtained regardless of other methods used. The sampling intensity given for cover and frequency on page 7 is not adequate for frequency. This intensity was determined by Daubenmire in more mesic environments than found in Home Camp/Tuledad. Hyder and Tueller found that a frequency sample of 10 transects with 20, 50 x 50 cm quadrats/transect was adequate for the sagebrush type in Oregon and Nevada. I recommend that you use only frequency for trend evaluation.

c. Like canopy cover, basal area is a method used to characterize a site. It does not fluctuate wildly with weather as does canopy cover but is not sensitive enough for trend measurements. The cover classes reduce observer error, but will pick up only catastrophic changes. Measurement of total and dead basal cover of individual plants is a much better approach if you need data on basal area. We have been charting basal area through two cycles of a 3-pasture system and will send you the results when computed. I can say that after 1 cycle, only very small changes were noted.

d. Interpretation of trend data is very important in view of "Rationale" section on page 42. The important question is what constitutes a change in condition and direction of trend? This is not a~~llowed~~ddressed in the writeup and needs very clear definition. Is it just a statistical change of a few points ~~between measurements~~ between two measurements? The Forest Service, Intermountain Region, suggests a scale for the number of points required for a significant (not statistically) change between two measurements. I have enclosed a copy of this table for your consideration. I do not know the source of the data, but it does merit consideration.

4. I think two other approaches would help in data interpretation. Install some weather stations throughout the allotments. Construct exclosures on key habitats and make similar condition and trend measurements both inside and outside. We hear a lot about removing all livestock. It would be nice to show that proper livestock management can give the same results as does complete exclusion of livestock.

good

5. The Susanville District is to be complemented for their efforts to produce this kind of monitoring system. It represents more of a research approach than an administrative approach. I hope you can see it through and suggest all other BLM districts have the opportunity to adopt such a comprehensive program.

Sincerely,

Richard E. Eckert, Jr.
Range Scientist

Enc.

EXHIBIT IV

TABLE III

Soil Stability Rating Table - Also used for vegetation

Number of condition rating points required for a significant change in trend (100 point scale).

Very Poor		Poor		Fair		Good		Excellent	
Previous Rating	Points required for significant change	Previous Rating	Points required for significant change	Previous Rating	Points required for significant change	Previous Rating	Points required for significant change	Previous Rating	Points required for significant change
1	25	21	20	41	15	61	10	Any trend in excellent condition requires at least a 5 point change.	
2	25	22	20	42	15	62	10		
3	24	23	19	43	14	63	9		
4	24	24	19	44	14	64	9		
5	24	25	19	45	14	65	9		
6	24	26	19	46	14	66	9		
7	23	27	18	47	13	67	8		
8	23	28	18	48	13	68	8		
9	23	29	18	49	13	69	8		
10	23	30	18	50	13	70	8		
11	22	31	17	51	12	71	7		
12	22	32	17	52	12	72	7		
13	22	33	17	53	12	73	7		
14	22	34	17	54	12	74	7		
15	21	35	16	55	11	75	6		
16	21	36	16	56	11	76	6		
17	21	37	16	57	11	77	6		
18	21	38	16	58	11	78	6		
19	20	39	15	59	10	79	5		
20	20	40	15	60	10	80	5		

To use this table, proceed as follows:

1. Locate the number corresponding to the total score for either soil or vegetation in the "Previous Rating" column.
2. The points required for a significant trend from this rating is then found on the same line in the adjacent column.

For example, if the total score for vegetation is 53, the points required for a significant trend either up or down would be "12".

FLEISCHMANN COLLEGE OF AGRICULTURE

UNIVERSITY OF NEVADA RENO
DIVISION OF RENEWABLE NATURAL RESOURCES
920 VALLEY ROAD
RENO NEVADA 89512

RESIDENT INSTRUCTION
AGRICULTURAL EXPERIMENT STATION
COOPERATIVE EXTENSION SERVICE

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CEDARVILLE, CALIFORNIA

November 30, 1979

Dept. of Interior
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DEC 6 1979
BUREAU OF LAND
MANAGEMENT
SUSANVILLE, CALIFORNIA

Mr. Rex Cleary, D.M.
Bureau of Land Management
P. O. Box 1090
Susanville, CA 96130

Dear Mr. Cleary:

The monitoring system plan for Tuledad/Home Camp does recognize with a vengence the need which so many have emphasized. One hopes that this plan can be fully implemented. It is so ambitious that anticipation of exigencies and consideration of priorities seems adviseable.

III, "Constraints" mentions present levels of funding. What about lower levels? If appropriations are not authorized at present levels or if current rates of inflation continue or accelerate through 1984, what adjustments will be necessary? Salaries, wages, support costs may all go up, cutting effective funds as much as 50%. Will transects be read less often? Will monitoring of vegetation be continued at the expense of less important phases?

Table v, 1. Vegetation and 2. Wildlife seem good headings but should 2-a,c,e,f and g be under 1. Vegetation? Or else 1. means "Livestock"?

I like Table VI. The concept "consistently" is the key in 1. a and b. Table VI. b might consider trail construction out of watering points as a possibility.

Very truly yours,

Joe Robertson

JOSEPH H. ROBERTSON,
Professor Emeritus

CSO Comments

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JAN 16 1980
BUREAU OF LAND
MANAGEMENT
CEDARVILLE, CALIFORNIA

Tuledad/Homecamp Monitoring System

Wildlife:

Objective is related to numbers of non-game species. Methodology will probably only measure relative numbers.

Variances requiring change is related to abundance by species, and diversity.
I don't think the proposed methodology will measure diversity and/or abundance by species.
Why wait until 1984 to start program? The 1st level of information (baseline) should be done as soon as possible.

Riparian Vegetation. What is the rationale for waiting two grazing cycles before making changes?

Is there no juniper involved?? (for better or worse

Tukedad/Home Camp Monitoring System Willoughby

pg. 7 ¶ 2 "Each stand will be monitored at six-year intervals during the "rest" year."

I don't believe every six years is often enough. Because of the variability of climate the results obtained during the sixth year can be heavily influenced by such factors as precipitation (e.g., heavy precipitation in the sampling year would bias the sample results and make the productivity, etc. seem greater than was actually the case in the 5 years prior to the sample year. The same would be true (in reverse) of a drought in or prior to the sample year).

pg. 9 3rd ¶ from bottom: "Extrapolation can be made to other areas": This is only true if these other areas are comparable in plant composition, utilization by livestock + wildlife, and a host of other parameters. This should me made clear in this report.

(1c+)
pg. 40 (d) If condition + trend indices are up it is okay to wait 2 grazing cycles to adjust because this will not result in adverse impacts to vegetation or

do not have the luxury of waiting 2 cycles — this can (and probably will) have adverse impacts on both vegetation + wildlife which may take [redacted] years to mitigate. If condition + trend [redacted] indices are down, changes should be made immediately, especially in [redacted] key + important habitats such as riparian.

Page 12 - Macroinvertebrates should probably be sampled on an yearly basis instead of every 4 years. These animals are closely related to the physical and chemical nature of the stream. Sampling could be easily biased relative to conditions at the time of sampling and not give a true picture over a 4 year period - why so few sampling sites on each stream?

Page 13 -

Objective should be to measure change in diversity not just numbers of species. Diversity is made up of 2 components — density as well as number of species.

The variable strip transect method of Emlen 1971 is only useful in the determination of wintering bird density

birds (See Emlen 1977 auk). Spot-mapping, or transects of set width if the extent of the habitat sampled is small, should be utilized to determine bird densities.
Species occurrence says little about the overall health of the plant community.